CHAPTER 21

LIST OF EFFECTIVE TEMPORARY REVISIONS

FOLLOWING IS A COMPLETE LISTING OF ALL ACTIVE TEMPORARY REVISIONS (TR'S). TR'S NOT LISTED SHOULD BE REMOVED. THE ATA NUMBER, CONFIG CODE AND PAGE NUMBER IDENTIFIES THE PAGE PRECEDING THE TR.

TR NUMBER	ATA NUMBER	CONFIG CODE	PAGE NUMBER	TR DATE
NONE				

CHAPTER 21

AIR CONDITIONING SYSTEM

LIST OF EFFECTIVE PAGES

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List of Effective Pages	1	Jun 15/96	
	2	Jun 15/96	
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	5	Jun 15/96	
	6	Jun 15/96	
	7	Jun 15/96	
	8	Jun 15/96	
	9	Jun 15/96	
	10	Jun 15/96	
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	8	May 15/89	
	9	May 15/89	
	10	Nov 15/89	
	11	Nov 15/89	
	12	May 15/89	
	13	Dec 15/94	
	14	Nov 15/89	
	15	May 15/89	
	16	Nov 15/89	
	17	May 15/89	
	18	May 15/89	
	19	May 15/89	
	20	May 15/89	
	21	May 15/89	
	22	May 15/89	
21-conts	1	Mar 15/84	
21-conts	2	Dec 15/91	
21-conts	3	Dec 15/91	
21-conts	4	Dec 15/94	
21-conts	5	Jun 15/92	
21-conts	6	May 15/88	
21-conts	7	May 15/86	
21-conts	8	Aug 15/82	
21-conts	9/10	Jun 15/93	
21-DIAGM	1	Mar 15/83	
21-DIAGM	2	Mar 15/84	
21-DIAGM	3	Mar 15/84	
21-DIAGM	4	Nov 15/84	
21-DIAGM	5	Mar 15/84	
21-DIAGM	6	May 15/87	
21-DIAGM	7	Mar 15/84	
21-DIAGM	8	Nov 15/84	
21-DIAGM	9	Mar 15/84	
21-DIAGM	10	Nov 15/87	
21-DIAGM	11	Mar 15/84	
21-DIAGM	12	Mar 15/84	
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21-DIAGM	15	Mar 15/84	
21-DIAGM	16	Mar 15/84	
21-DIAGM	17	Mar 15/84	
21-DIAGM	18	Mar 15/84	
21-DIAGM	19	May 15/87	
21-DIAGM	20	Mar 15/84	
21-DIAGM	21	Mar 15/84	
21-DIAGM	22	Mar 15/84	
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21-INDEX	1	Mar 15/84	
21-INDEX	2	Mar 15/84	
21-INDEX	3	Mar 15/84	
21-INDEX	4	Jun 15/93	
21-INDEX	5	Mar 15/84	
21-INDEX	6	Jun 15/93	
21-INDEX	7	Mar 15/84	
21-INDEX	8	Mar 15/84	
21-INDEX	9	Nov 15/87	
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21-INDEX	11	Mar 15/84	
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21-INDEX	13	Jul 15/84	
21-INDEX	14	Jul 15/84	
21-INDEX	15	Jul 15/84	
21-INDEX	16	May 15/90	
21-INDEX	17	Jul 15/84	
21-INDEX	18	Jul 15/84	
21-INDEX	19	May 15/87	
21-INDEX	20	Jul 15/84	
21-INDEX	21	Jul 15/84	
21-INDEX	22	Jul 15/84	
21-INDEX	23	May 15/87	
21-INDEX	24	Dec 15/94	
21-INDEX	25/26	Jul 15/84	
21-00-00	1	Dec 15/79	
21-00-00	2	Mar 15/81	
21-00-00	3	Sep 15/80	
21-00-00	4	Sep 15/80	
21-00-00	5	Sep 15/80	
21-00-00	6	Sep 15/80	
21-00-00	7/8	Sep 15/80	
21-00-00	9/10	Mar 15/80	
21-00-00	11/12	Mar 15/80	
21-00-00	13	Nov 15/82	
21-00-00	14	Nov 15/82	
21-00-00	15/16	Mar 15/80	
21-00-00	17/18	Mar 15/80	
21-00-00	19/20	Mar 15/80	
21-00-00	21/22	Mar 15/80	
21-00-00	23/24	Mar 15/80	
21-00-00	25/26	Mar 15/80	
21-00-00	27/28	Mar 15/80	
21-00-00	29/30	Mar 15/80	
21-00-00	31/32	Nov 15/82	
21-00-00	33/34	Nov 15/82	
21-00-00	35/36	Nov 15/82	
21-00-00	201	Jun 15/80	
21-00-00	202	Mar 15/80	
21-00-00	203	Aug 15/81	
21-00-00	204	Dec 15/94	
21-00-00	205	May 15/90	
21-00-00	206	May 15/90	
21-00-00	207	May 1/72	
21-00-00	208	May 1/72	
21-00-00	209	Jun 15/80	
21-00-00	210	May 15/82	
21-00-00	211	Jun 15/80	
21-00-00	212	May 15/90	
21-00-00	213	May 15/82	
21-00-00	214	May 1/72	
21-00-00	215	Dec 15/94	
21-00-00	216	Jun 15/80	
21-00-00	217	May 15/90	
21-00-00	218	Dec 15/94	
21-00-00	219	Dec 15/94	
21-00-00	220	Dec 15/94	
21-00-00	221	Aug 15/82	
21-00-00	222	May 15/90	
21-00-00	223	Nov 15/83	
21-00-00	224	May 15/90	
21-00-00	225	May 15/90	
21-00-00	226	Nov 15/83	
21-00-00	227	Nov 15/83	
21-00-00	228	Nov 15/83	
21-00-00	229	Nov 15/83	
21-00-00	230	Nov 15/83	
21-00-00	231/232	Nov 15/83	
21-00-01	501	Aug 15/81	
21-00-01	502	Feb 15/76	
21-10-00	1	Mar 15/81	
21-10-00	2	Mar 15/81	
21-10-00	3	Mar 15/81	
21-10-00	4	Nov 15/82	
21-10-00	5/6	Nov 15/82	
21-10-00	7/8	Nov 15/82	
21-10-00	9	Nov 15/82	
21-10-00	10	Nov 15/82	
21-10-00	11/12	Nov 15/82	
21-20-00	1	Nov 15/81	
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21-20-00	3	Nov 15/81	
21-20-00	4	Mar 15/83	
21-20-00	5/6	Dec 15/79	
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21-21-00	3	Aug 15/81	
21-21-00	4	Mar 15/80	
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21-21-00	6	Mar 15/80	
21-21-00	7	May 15/82	
21-21-00	8	Mar 15/91	
21-21-00	9/10	May 15/82	
21-21-00	11	Mar 15/91	
21-21-00	12	May 15/82	
21-21-00	13	Jul 15/83	
21-21-00	14	Jul 15/83	
21-21-00	15	Jul 15/83	

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21-21-00	16	Jul 15/83	
21-21-00	17	Jul 15/83	
21-21-00	18	Jul 15/83	
21-21-00	19	Mar 15/91	
21-21-00	20	Jul 15/83	
21-21-00	21	Mar 15/91	
21-21-00	22	Jul 15/83	
21-21-00	23	Mar 15/91	
21-21-00	24	Mar 15/91	
21-21-00	101	Mar 15/81	
21-21-00	102	Mar 15/84	
21-21-00	103	Nov 15/83	
21-21-00	104	Nov 15/83	
21-21-00	105	May 15/82	
21-21-00	106	May 15/82	
21-21-00	107	May 15/82	
21-21-00	108	May 15/82	
21-21-00	109/110	Mar 15/84	
21-21-00	111/112	Mar 15/84	
21-21-00	113/114	Mar 15/84	
21-21-00	115/116	Mar 15/84	
21-21-01	201	Aug 15/82	
21-21-01	202	May 15/85	
21-21-01	203	Aug 15/82	
21-21-01	204	Aug 15/82	
21-21-01	401	Jun 15/93	
21-21-01	402	Jun 15/93	
21-21-01	403	Jun 15/93	
21-21-01	404	Jun 15/93	
21-21-01	405	Jun 15/93	
21-21-01	406	Nov 15/85	
21-21-01	407	Jul 15/83	
21-21-01	408	Jun 15/93	
21-21-01	409	Jun 15/93	
21-21-01	410	Jun 15/93	
21-21-01	411	Jun 15/93	
21-21-01	412	Jun 15/93	
21-21-01	413	Jun 15/93	
21-21-01	414	Jun 15/93	
21-21-01	501	Aug 15/82	
21-21-01	502	Aug 15/82	
21-21-01	503	Aug 15/78	
21-21-01	504	Feb 15/78	
21-21-05	201	Mar 15/84	
21-21-05	202	Mar 15/91	
21-21-05	401	Nov 15/82	
21-21-05	402	Nov 15/82	
21-21-05	403/404	Aug 15/81	
21-21-08	401	Dec 15/79	
21-21-08	402	Aug 15/81	
21-21-08	403	Aug 15/81	
21-21-08	404	Mar 15/80	
21-21-11	401	Nov 15/82	
21-21-11	402	Nov 15/82	
21-21-11	403/404	Aug 15/81	
21-21-13	401	Mar 15/84	
21-21-13	402	Mar 15/84	
21-21-13	403	Mar 15/84	
21-21-13	404	Mar 15/84	
21-21-13	405/406	Mar 15/84	
21-21-13	407/408	Mar 15/84	
21-21-13	409/410	Mar 15/84	
21-21-14	401	Nov 15/82	
21-21-14	402	Nov 15/82	
21-21-14	403	Nov 15/82	
21-21-14	404	Nov 15/82	
21-21-14	405/406	Sep 15/79	
21-21-14	407/408	Sep 15/79	
21-21-15	401	Aug 15/81	
21-21-15	402	Aug 15/81	
21-21-15	403	Aug 15/81	
21-21-15	404	Aug 15/81	
21-21-15	405	Aug 15/81	
21-21-15	406	Aug 15/81	
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21-21-15	411/412	Sep 15/79	
21-21-15	413/414	Sep 15/79	
21-21-16	401	Aug 15/81	
21-21-16	402	Sep 15/79	
21-21-16	403	Sep 15/79	
21-21-16	404	Mar 15/80	
21-21-17	401	Aug 15/81	
21-21-17	402	Aug 15/81	
21-21-17	403	Aug 15/81	
21-21-17	404	Mar 15/80	
21-21-21	401	Nov 15/82	
21-21-21	402	Nov 15/82	
21-21-21	403/404	Nov 15/82	
21-21-24	401	Aug 15/81	
21-21-24	402	Aug 15/81	
21-21-24	403	Aug 15/81	
21-21-24	404	May 15/88	
21-21-28	401	Aug 15/81	
21-21-28	402	Aug 15/81	
21-21-28	403	Aug 15/81	

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21-21-30	401	Nov 15/87	
21-21-30	402	Nov 15/87	
21-21-30	403	Nov 15/87	
21-21-30	404	Nov 15/87	
21-21-36	401	Nov 15/81	
21-21-36	402	Jul 15/84	
21-21-36	403	Nov 15/81	
21-21-36	404	Aug 15/81	
21-21-37	401	Mar 15/91	
21-21-37	402	Mar 15/91	
21-21-37	403	Mar 15/91	
21-21-37	404	Mar 15/91	
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21-21-38	402	Nov 15/81	
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21-21-38	404	Nov 15/81	
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21-22-00	3	Mar 15/84	
21-22-00	4	Aug 15/81	
21-22-00	101	Jul 15/83	
21-22-00	102	Jul 15/83	
21-22-00	103	Jul 15/83	
21-22-00	104	Jul 15/83	
21-22-00	105/106	Jul 15/83	
21-22-01	401	Aug 15/81	
21-22-01	402	Jul 15/83	
21-22-01	403/404	Jul 15/83	
21-23-00	1	Dec 15/91	
21-23-00	2	Aug 15/82	
21-23-00	3/4	Sep 15/80	
21-23-00	5/6	Jun 15/80	
21-23-00	7/8	Jun 15/80	
21-23-00	9/10	Jun 15/80	
21-23-00	11/12	Jul 15/83	
21-23-00	13	Sep 15/80	
21-23-00	14	Jun 15/80	
21-23-00	15/16	Jun 15/80	
21-23-01	501	Nov 15/82	
21-23-01	502	Nov 15/82	
21-23-01	503/504	Nov 15/74	
21-23-05	401	Nov 15/88	
21-23-05	402	Nov 15/88	
21-23-05	403	Nov 15/88	
21-23-05	404	Nov 15/88	
21-23-05	405	Nov 15/88	
21-23-05	406	Nov 15/88	
21-23-05	407	Nov 15/88	
21-23-05	408	Nov 15/88	
21-23-05	701	Jul 15/83	
21-23-05	702	Jul 15/83	
21-23-05	703	Nov 15/81	
21-23-05	704	Nov 15/81	
21-23-05	705/706	Nov 15/83	
21-23-05	801	Mar 15/84	
21-23-05	802	Mar 15/84	
21-23-05	803	Mar 15/84	
21-23-05	804	Mar 15/84	
21-23-05	805	Mar 15/84	
21-23-05	806	Mar 15/84	
21-23-05	807	Mar 15/84	
21-23-05	808	Mar 15/84	
21-23-05	809	Mar 15/84	
21-23-05	810	Mar 15/84	
21-23-05	811/812	Mar 15/84	
21-23-06	701	Aug 15/81	
21-23-06	702	Aug 15/81	
21-23-08	401	Aug 15/81	
21-23-08	402	Dec 15/79	
21-23-08	403/404	Dec 15/79	
21-23-09	801	Dec 15/95	
21-23-09	802	Dec 15/91	
21-23-09	803/804	Dec 15/95	
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21-24-00	3	Jul 15/83	
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21-24-00	10	Feb 15/82	
21-24-00	11/12	Feb 15/82	
21-24-00	101	May 15/82	
21-24-00	102	Mar 15/81	
21-24-00	103	Mar 15/81	
21-24-00	104	Mar 15/81	
21-24-00	105	Mar 15/81	
21-24-00	106	Mar 15/81	
21-24-00	107/108	Mar 15/81	
21-24-01	401	Nov 15/81	

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21-24-01	403/404	Dec 1/72	
21-24-02	201/202	Nov 15/82	
21-24-02	401	Jun 15/80	
21-24-02	402	Feb 15/76	
21-24-02	403/404	Dec 1/71	
21-24-02	501	Jun 15/80	
21-24-02	502	Jun 15/80	
21-24-06	201	Dec 15/79	
21-24-06	202	Dec 15/79	
21-24-06	203/204	Dec 15/79	
21-24-06	401	Jun 15/80	
21-24-06	402	Nov 15/74	
21-24-06	403	Nov 15/74	
21-24-06	404	Jun 15/80	
21-24-06	501/502	Nov 15/81	
21-24-07	401	May 15/82	
21-24-07	402	Feb 15/82	
21-24-07	403/404	May 15/82	
21-24-08	601	Nov 15/84	
21-24-08	602	Nov 15/84	
21-24-08	603/604	Nov 15/84	
21-24-08	701	May 15/82	
21-24-08	702	Feb 15/82	
21-24-08	703	Aug 15/81	
21-24-08	704	Aug 15/81	
21-24-08	705/706	Aug 15/81	
21-24-11	401	Mar 15/81	
21-24-11	402	Mar 15/81	
21-24-11	403	Mar 15/81	
21-24-11	404	Mar 15/81	
21-24-12	701	Nov 15/81	
21-24-12	702	Nov 15/81	
21-24-12	703/704	Nov 15/73	
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21-25-00	3/4	May 15/82	
21-25-00	5/6	May 15/82	
21-25-00	7	May 15/82	
21-25-00	8	May 15/82	
21-25-00	9	Jul 15/83	
21-25-00	10	Dec 15/95	
21-25-00	11/12	May 15/82	
21-25-00	13/14	May 15/82	
21-25-00	15	May 15/82	
21-25-00	16	Aug 15/82	
21-25-00	17	Jun 15/93	
21-25-00	18	Aug 15/82	
21-25-00	19	May 15/82	
21-25-00	20	May 15/82	
21-25-00	21/22	May 15/82	
21-25-00	23/24	Nov 15/87	
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21-25-00	101	Feb 15/82	
21-25-00	102	Aug 15/82	
21-25-00	103	Aug 15/82	
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21-25-00	107	Aug 15/82	
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21-25-00	111	Nov 15/88	
21-25-00	112	Aug 15/82	
21-25-00	113/114	Nov 15/82	
21-25-00	115/116	Nov 15/82	
21-25-00	117	Nov 15/82	
21-25-00	118	Nov 15/82	
21-25-00	119	May 15/85	
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21-25-00	121	Dec 15/91	
21-25-00	122	Nov 15/84	
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21-25-00	124	Nov 15/88	
21-25-00	125	Jul 15/83	
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21-25-00	127	Jul 15/83	
21-25-00	128	Jul 15/83	
21-25-00	129/130	Jul 15/83	
21-25-00	131/132	May 15/85	
21-25-00	133/134	May 15/85	
21-25-00	135	Jul 15/83	
21-25-00	136	Jul 15/83	
21-25-00	137	Jul 15/83	
21-25-00	138	Jul 15/83	
21-25-00	139	Nov 15/88	
21-25-00	140	Jul 15/83	
21-25-00	301	Aug 15/82	1
21-25-00	302	Aug 15/82	1
21-25-00	301	May 15/89	2
21-25-00	302	May 15/82	2
21-25-00	303/304	Nov 15/81	2
21-25-00	501	Jul 15/83	
21-25-00	502	Jul 15/83	
21-25-00	503	Jul 15/83	

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	21-25-00	504	Nov 15/84	
	21-25-00	505	May 15/88	
	21-25-00	506	May 15/88	
	21-25-00	507	May 15/88	
	21-25-00	508	May 15/88	
	21-25-00	509	May 15/88	
	21-25-00	510	May 15/88	
	21-25-01	201/202	Mar 15/80	
	21-25-01	401	Nov 15/85	
	21-25-01	402	Jul 15/83	
	21-25-01	403	Jul 15/83	
	21-25-01	404	Jul 15/83	
	21-25-01	501	May 15/82	
	21-25-01	502	Feb 15/82	
	21-25-01	701/702	Feb 15/82	
	21-25-02	201	Nov 15/81	
	21-25-02	202	Nov 15/81	
	21-25-02	401	Feb 15/82	
	21-25-02	402	Feb 15/82	
	21-25-02	403/404	Feb 15/82	
	21-25-02	501	May 15/82	
	21-25-02	502	May 15/82	
	21-25-02	701/702	Feb 15/82	
	21-25-03	201	Dec 15/80	
	21-25-03	202	Mar 15/80	
	21-25-03	203/204	Sep 15/79	
	21-25-03	401	Nov 15/83	
	21-25-03	402	Nov 15/83	
	21-25-03	403/404	Nov 15/81	
	21-25-04	201	Feb 15/82	
	21-25-04	202	Aug 15/82	
	21-25-04	203	Aug 15/81	
	21-25-04	204	Aug 15/81	
	21-25-04	401	Aug 15/81	
	21-25-04	402	Aug 15/81	
	21-25-04	403/404	Dec 1/71	
	21-25-05	201	Mar 15/80	
	21-25-05	202	Mar 15/80	
	21-25-05	401	Sep 15/79	
	21-25-05	402	Sep 15/79	
	21-25-05	403/404	Nov 15/73	
	21-25-05	501	Sep 15/79	
	21-25-05	502	Nov 15/81	
	21-25-05	503	Aug 15/81	
R	21-25-05	504	Jun 15/96	
R	21-25-05	505/506	Jun 15/96	
	21-25-06	201	Aug 15/81	
	21-25-06	202	Aug 15/81	
	21-25-06	401	Aug 15/81	
	21-25-06	402	Aug 15/81	
	21-25-06	403/404	Jun 15/80	
	21-25-06	501	Jun 15/93	
	21-25-06	502	Jun 15/93	
	21-25-06	503	May 15/87	
R	21-25-06	504	Jun 15/96	
R	21-25-06	505/506	Jun 15/96	
	21-25-07	401	Nov 15/81	
	21-25-07	402	Nov 15/81	
	21-25-07	403/404	Feb 15/73	
	21-25-07	501	Nov 15/81	
	21-25-07	502	Nov 15/81	
	21-25-08	401	Aug 15/81	
	21-25-08	402	Aug 15/81	
	21-25-08	403/404	Feb 15/73	
	21-25-08	501	Aug 15/82	
	21-25-08	502	Aug 15/78	
	21-25-08	503/504	Dec 15/79	
	21-25-09	201/202	Aug 15/82	
	21-25-09	401	Sep 15/80	
	21-25-09	402	Sep 15/79	
	21-25-09	403	Sep 15/79	
	21-25-09	404	Feb 15/78	
	21-25-10	201/202	May 15/85	
	21-25-10	401	Nov 15/81	
	21-25-10	402	Nov 15/81	
	21-25-10	403	Nov 15/81	
	21-25-10	404	Nov 15/77	
	21-25-15	401	Nov 15/88	1
	21-25-15	402	Nov 15/88	1
	21-25-15	403/404	Nov 15/88	1
	21-25-15	401	Feb 15/82	2
	21-25-15	402	Feb 15/82	2
	21-25-15	403/404	Feb 15/82	2
	21-25-15	501	Nov 15/88	1
	21-25-15	502	Nov 15/88	1
	21-25-15	503/504	Nov 15/88	1
	21-25-15	501	May 15/85	2
	21-25-15	502	Nov 15/84	2
	21-25-15	503	Jul 15/83	2
	21-25-15	504	Nov 15/81	2
	21-25-15	505	Mar 15/84	2
	21-25-15	506	Mar 15/84	2
	21-25-16	401	Nov 15/88	1
	21-25-16	402	Nov 15/88	1
	21-25-16	403/404	Nov 15/88	1
	21-25-16	401	May 15/85	2

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21-25-16	402	May 15/85	2
21-25-17	401	Nov 15/88	1
21-25-17	402	Nov 15/88	1
21-25-17	403/404	Nov 15/88	1
21-25-17	401	May 15/82	2
21-25-17	402	May 15/82	2
21-25-17	403/404	May 15/82	2
21-25-18	401	May 15/82	
21-25-18	402	May 15/82	
21-25-18	403/404	May 15/82	
21-25-21	401	Feb 15/82	
21-25-21	402	Feb 15/82	
21-25-21	403/404	Nov 15/81	
21-25-24	401	May 15/82	
21-25-24	402	May 15/82	
21-25-24	403/404	May 15/82	
21-25-26	401	May 15/82	
21-25-26	402	May 15/82	
21-25-26	403/404	Nov 15/81	
21-25-30	401	Aug 15/82	
21-25-30	402	Aug 15/82	
21-25-30	403	Aug 15/76	
21-25-30	404	Aug 15/76	
21-25-31	401	May 15/85	
21-25-31	402	Nov 15/81	
21-25-31	403	May 15/85	
21-25-31	404	Nov 15/81	
21-25-32	401	Feb 15/82	
21-25-32	402	Feb 15/82	
21-25-32	403/404	Feb 15/82	
21-25-32	501	Feb 15/82	
21-25-32	502	Feb 15/82	
21-25-32	701/702	Feb 15/82	
21-25-33	401	May 15/82	
21-25-33	402	May 15/82	
21-25-33	403/404	Nov 15/81	
21-25-34	201	Mar 15/91	
21-25-34	202	Aug 15/82	
21-25-34	203/204	Nov 15/81	
21-25-34	401	Nov 15/81	
21-25-34	402	Aug 15/82	
21-25-34	403/404	Nov 15/83	
21-25-35	201	Feb 15/82	
21-25-35	202	Feb 15/82	
21-25-35	401	Nov 15/81	
21-25-35	402	Nov 15/81	
21-25-35	403/404	Nov 15/81	
21-25-35	501	Nov 15/81	
21-25-35	502	Nov 15/81	
21-25-35	503/504	Nov 15/81	
21-25-36	401	May 15/82	
21-25-36	402	May 15/82	
21-25-36	403	May 15/82	
21-25-36	404	Nov 15/81	
21-25-39	401	Feb 15/82	
21-25-39	402	Feb 15/82	
21-25-39	403	Feb 15/82	
21-25-39	404	Nov 15/83	
21-25-39	501	May 15/82	
21-25-39	502	Jul 15/83	
21-25-39	503/504	Jul 15/83	
21-25-40	201	Aug 15/82	
21-25-40	202	Aug 15/82	
21-25-40	203	Aug 15/82	
21-25-40	204	Aug 15/82	
21-25-40	205	Aug 15/82	
21-25-40	206	Aug 15/82	
21-25-40	207/208	Aug 15/82	
21-25-40	401	May 15/82	
21-25-40	402	May 15/82	
21-25-40	403/404	May 15/82	
21-25-40	501	Nov 15/84	
21-25-40	502	Nov 15/84	
21-25-40	503/504	Nov 15/81	
21-25-41	401	May 15/82	
21-25-41	402	Nov 15/81	
21-25-41	403	Nov 15/81	
21-25-41	404	Nov 15/81	
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21-26-00	7	Nov 15/81	
21-26-00	8	Mar 15/91	
21-26-00	9	Mar 15/91	
21-26-00	10	May 15/82	
21-26-00	101	Mar 15/81	
21-26-00	102	Mar 15/91	
21-26-00	103	Aug 15/81	
21-26-00	104	Aug 15/81	
21-26-00	105	Aug 15/81	
21-26-00	106	May 15/82	
21-26-02	401	Nov 15/81	
21-26-02	402	Nov 15/81	

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21-26-02	403/404	Apr 1/72	
21-26-03	401	Mar 15/91	
21-26-03	402	Mar 15/91	
21-26-03	403/404	Mar 15/91	
21-26-06	401	Mar 15/91	
21-26-06	402	Mar 15/91	
21-26-06	403/404	Apr 1/72	
21-26-06	501/502	Aug 15/82	
21-26-07	401	Mar 15/91	
21-26-07	402	Mar 15/91	
21-26-07	403	Mar 15/91	
21-26-07	404	Mar 15/91	
21-26-08	401	Mar 15/91	
21-26-08	402	Mar 15/91	
21-26-08	403/404	Mar 15/80	
21-26-09	401	Mar 15/91	
21-26-09	402	Mar 15/91	
21-26-09	403	Dec 15/79	
21-26-09	404	Dec 15/79	
21-26-12	401	Nov 15/81	
21-26-12	402	Jun 15/80	
21-26-13	201	Jul 15/83	
21-26-13	202	Jul 15/83	
21-26-13	203/204	Jul 15/83	
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21-31-00	7/8	Nov 15/81	
21-31-00	9/10	Nov 15/81	
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21-31-00	12	Jul 15/84	
21-31-00	13	Jul 15/84	
21-31-00	14	Jul 15/84	
21-31-00	15	Nov 15/82	
21-31-00	16	Jun 15/80	
21-31-00	17/18	Nov 15/81	
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21-31-00	102	Jul 15/84	
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21-31-00	122	Dec 15/91	
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21-31-00	124	Mar 15/81	
21-31-00	125	Jul 15/84	
21-31-00	126	Jul 15/84	
21-31-00	127/128	Jul 15/84	
21-31-00	129/130	Jul 15/84	
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21-31-00	202	Feb 15/82	
21-31-00	203	Nov 15/85	
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21-31-00	206	May 15/86	
21-31-00	207/208	May 15/86	
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21-31-00	506	Aug 15/81	
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21-31-00	515	Jun 15/92	
21-31-00	516	Jun 15/92	
21-31-00	517	Jun 15/92	
21-31-00	518	Jun 15/92	
21-31-00	519	Jun 15/93	
21-31-00	520	Jun 15/93	

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21-31-00	521	Jun 15/93	
21-31-00	522	Jun 15/93	
21-31-00	523	Jun 15/93	
21-31-00	524	Jul 15/83	
21-31-01	401	Aug 15/81	
21-31-01	402	Jul 15/83	
21-31-02	401	May 15/73	
21-31-02	402	Aug 15/81	
21-31-02	403/404	Aug 15/81	
21-31-02	501	Jul 15/83	
21-31-02	502	Jul 15/83	
21-31-02	503/504	Jul 15/83	
21-31-03	401	Nov 15/81	
21-31-03	402	Nov 15/81	
21-31-03	403	Nov 15/81	
21-31-03	404	Nov 15/81	
21-31-03	405/406	Jun 15/80	
21-31-51	401	Nov 15/81	
21-31-51	402	Nov 15/83	
21-31-51	403	Nov 15/83	
21-31-51	404	Sep 15/80	
21-31-51	405/406	Nov 15/83	
21-31-52	201	Feb 15/82	
21-31-52	202	Feb 15/82	
21-31-53	201	Feb 15/76	
21-31-53	202	Feb 15/76	
21-31-53	203/204	Feb 15/76	
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21-32-00	7/8	Aug 15/81	
21-32-00	101	Mar 15/81	
21-32-00	102	Mar 15/81	
21-32-00	103	Mar 15/81	
21-32-00	104	Mar 15/81	
21-32-00	105/106	Mar 15/81	
21-32-01	201	Feb 15/82	
21-32-01	202	Aug 15/78	
21-32-01	203/204	May 15/77	
21-32-01	401	Nov 15/81	
21-32-01	402	Jun 15/93	
21-32-01	501	Dec 15/95	
21-32-01	502	Dec 15/95	
21-32-01	503	Dec 15/95	
21-32-01	504	Dec 15/95	

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21-32-01	505	Dec 15/95	
21-32-01	506	Dec 15/95	
21-32-01	507/508	May 15/86	
21-32-01	601	Aug 15/81	
21-32-01	602	Aug 15/81	
21-32-03	401	Dec 1/71	
21-32-03	402	Nov 15/85	
21-32-06	401	Nov 15/81	
21-32-06	402	Nov 15/78	
21-32-06	403/404	Nov 15/78	
21-32-06	601/602	Nov 15/78	
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21-33-00	502	Jun 15/80	
21-33-00	503/504	Mar 15/80	
21-33-04	401	Dec 15/79	
21-33-04	402	Nov 15/78	
21-34-00	601	Aug 15/81	
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21-34-00	609/610	Aug 15/81	
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21-41-00	7/8	May 15/90	
21-41-00	9/10	May 15/90	
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21-41-00	18	Mar 15/91	
21-41-00	101	Mar 15/81	
21-41-00	102	Mar 15/81	
21-41-00	103	Mar 15/81	
21-41-00	104	May 15/89	

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21-41-00	105	Aug 15/81	
21-41-00	106	Mar 15/91	
21-41-00	107	Mar 15/91	
21-41-00	108	Mar 15/91	
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21-41-00	114	Mar 15/91	
21-41-00	115	Mar 15/91	
21-41-00	116	Mar 15/91	
21-41-00	117/118	Mar 15/91	
21-41-00	119/120	May 15/90	
21-41-00	121/122	May 15/90	
21-41-00	123/124	May 15/90	
21-41-02	201/202	Feb 15/82	
21-41-02	401	May 15/90	
21-41-02	402	May 15/90	
21-41-02	403	Mar 15/91	
21-41-02	404	May 15/90	
21-41-02	405	May 15/90	
21-41-02	406	Mar 15/91	
21-41-02	501	Dec 15/79	
21-41-02	502	Dec 15/79	
21-41-02	503/504	Feb 15/73	
21-41-02	601	Apr 1/72	
21-41-02	602	Apr 1/72	
21-41-05	201/202	Feb 15/82	
21-41-05	401	Feb 15/82	
21-41-05	402	Feb 15/82	
21-41-05	403	Jul 15/83	
21-41-05	404	Dec 15/80	
21-41-05	405/406	Nov 15/81	
21-41-05	501/502	Feb 15/73	
21-41-09	401	Nov 15/81	1
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21-41-09	403	Mar 15/81	1
21-41-09	404	Mar 15/81	1
21-41-09	405	Nov 15/81	1
21-41-09	406	Nov 15/81	1
21-41-09	401	Nov 15/81	2
21-41-09	402	Nov 15/81	2
21-41-09	403	Jul 15/83	2
21-41-09	404	Aug 15/81	2
21-41-09	405/406	Nov 15/81	2
21-41-14	401	May 15/82	
21-41-14	402	May 15/82	
21-41-14	403/404	Mar 15/91	
21-41-17	201	Aug 15/81	
21-41-17	202	May 15/82	
21-41-17	203	Dec 15/80	
21-41-17	204	Dec 15/80	
21-41-17	401	May 15/87	
21-41-17	402	Nov 15/81	
21-41-17	403	Mar 15/91	
21-41-17	404	Dec 15/91	
21-41-17	405	Mar 15/91	
21-41-17	406	Mar 15/91	
21-41-17	407/408	Mar 15/91	
21-41-17	601	Nov 15/81	
21-41-17	602	Nov 15/81	
21-41-19	201/202	Feb 15/82	
21-41-19	401	Nov 15/81	
21-41-19	402	Nov 15/81	
21-41-19	403/404	Mar 15/91	
21-41-20	401	May 15/89	
21-41-20	402	May 15/89	
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21-43-00	114	Jul 15/83	
21-43-00	115	Jul 15/83	
21-43-00	116	Jul 15/83	
21-43-00	117	Dec 15/91	
21-43-00	118	Jul 15/83	
21-43-00	119/120	Jul 15/83	

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21-43-00	121/122	Jul 15/83	
21-43-00	123/124	Jul 15/83	
21-43-00	125/126	Jul 15/83	
21-43-00	127/128	Jul 15/83	
21-43-00	129/130	Jul 15/83	
21-43-00	131/132	Jul 15/83	
21-43-00	133/134	Jul 15/83	
21-43-00	135/136	Jul 15/83	
21-43-00	201/202	Dec 15/94	
21-43-00	501	Dec 15/94	
21-43-00	502	Dec 15/94	
21-43-00	503	Dec 15/94	
21-43-00	504	Dec 15/94	
21-43-01	401	Dec 15/94	
21-43-01	402	Dec 15/94	
21-43-01	403/404	Dec 15/94	
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21-43-07	3	Jul 15/83	
21-43-07	4	Jul 15/83	
21-43-08	401	Apr 1/72	
21-43-08	402	Apr 1/72	
21-43-08	403/404	Apr 1/72	
21-43-09	401	Apr 1/72	
21-43-09	402	Apr 1/72	
21-43-09	403/404	Jun 1/72	
21-43-09	501	May 1/72	
21-43-09	502	May 1/72	
21-44-00	1	Dec 15/80	
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21-44-00	3	Dec 15/80	
21-44-00	4	Dec 15/80	
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21-44-00	11/12	Dec 15/80	
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21-44-00	108	Mar 15/83	
21-44-00	109	Mar 15/81	
21-44-00	110	May 15/87	
21-44-00	111/112	May 15/87	
21-44-00	113/114	Nov 15/82	
21-44-00	115/116	Nov 15/82	
21-44-00	501	Mar 15/83	
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21-44-00	503	May 15/82	
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21-44-00	505	Dec 15/80	
21-44-00	506	Mar 15/83	
21-44-00	507/508	Dec 15/80	
21-44-01	401	May 15/82	
21-44-01	402	Jul 15/84	
21-44-01	403	Jul 15/84	
21-44-01	404	May 15/82	
21-44-01	405/406	Jul 15/84	
21-44-02	401	Nov 15/81	
21-44-02	402	Nov 15/81	
21-44-02	403	Nov 15/81	
21-44-02	404	Aug 15/81	
21-44-02	405/406	Nov 15/81	
21-44-03	401	Nov 15/81	
21-44-03	402	Nov 15/81	
21-44-03	403	Nov 15/81	
21-44-03	404	Aug 15/81	
21-44-03	405/406	Nov 15/81	
21-44-04	201/202	Mar 15/80	
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21-44-04	402	Mar 15/80	
21-44-04	403/404	Sep 15/73	
21-44-05	401	Mar 15/80	
21-44-05	402	Mar 15/80	
21-44-05	403/404	Sep 15/73	
21-44-06	401	Mar 15/80	
21-44-06	402	Sep 15/73	
21-44-06	403/404	Sep 15/80	
21-44-07	201/202	Feb 15/82	
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21-44-07	402	Dec 1/71	
21-44-07	403/404	Dec 1/71	
21-44-08	401	Sep 15/79	
21-44-08	402	Dec 1/71	
21-44-08	403/404	Dec 1/71	
21-44-09	401	Mar 15/84	
21-44-09	402	Dec 1/71	
21-44-09	403/404	Sep 15/80	
21-44-11	201/202	May 15/74	
21-44-11	401	Aug 15/75	
21-44-11	402	Aug 15/75	
21-44-11	403/404	May 15/75	

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21-44-12	402	Sep 15/79	
21-44-12	403/404	Dec 1/71	
21-44-13	401	Mar 15/81	
21-44-13	402	Mar 15/81	
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AIR CONDITIONING SYSTEM

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BLEED AIR AREA OVHT (J) LIGHT	PNEUMATICS 3622
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ENGINE BLEED AIR	PNEUMATICS 3621
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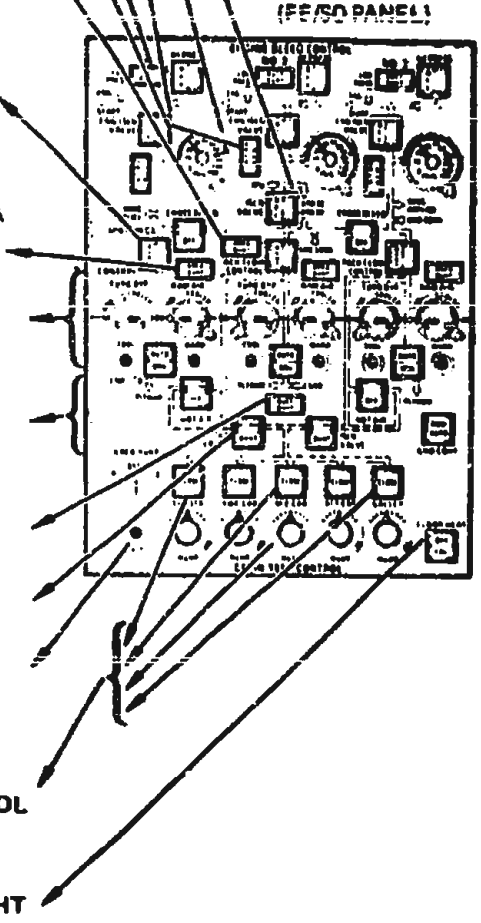
PACK (A, B, OR C) AREA OVHT LIGHT	PNEUMATICS 3622
PACK FLOW CONTROL	2162
ZONE TEMPERATURE CONTROL	2161


ENGINE BLEED AIR PNEUMATICS PACK FLOW CONTROL
DUCT OVHT, ENGINE (1, 2, 3) PNEUMATICS
BLEED AIR AREA OVHT (J) LIGHT PNEUMATICS
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AUTO/MANUAL PACK OPERATION
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HOT AIR DUCT OVHT LIGHT
HOT AIR SYSTEM
PACK FLOW CONTROL
PACK (A, B, OR C) AREA OVHT LIGHT
ACM NOISY
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HOT AIR ISLN VALVE OVHT LIGHT
HOT AIR SYSTEM
HOT AIR DUCT OVHT LIGHT
HOT AIR ISLN VALVE OVHT LIGHT
AREA OVHT TEST PNEUMATICS
CABIN TEMPERATURE CONTROL
FLT STA OR GALLEY TEMPERATURE CONTROL
ZONE TEMPERATURE CONTROL
FLOOR HEAT FAIL LIGHT
(FE/SO PANEL)

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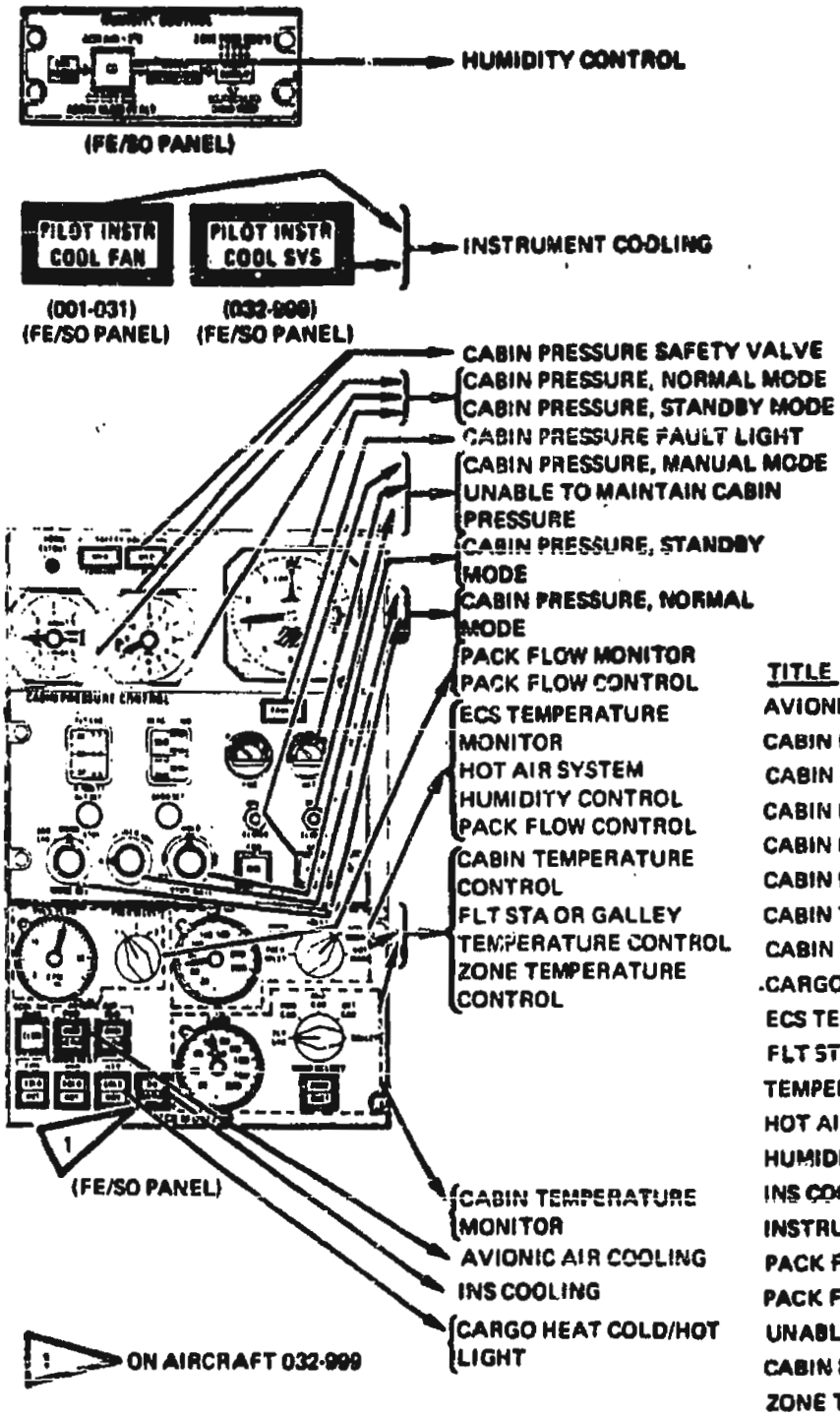
R AIR CONDITIONING CONTENTS

EFFECTIVITY: ALL

0018

AIR CONDITIONING CONTENTS



TITLE	CHAP/SEC
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CABIN PRESSURE, MANUAL MODE	2131
CABIN PRESSURE, NORMAL MODE	2131
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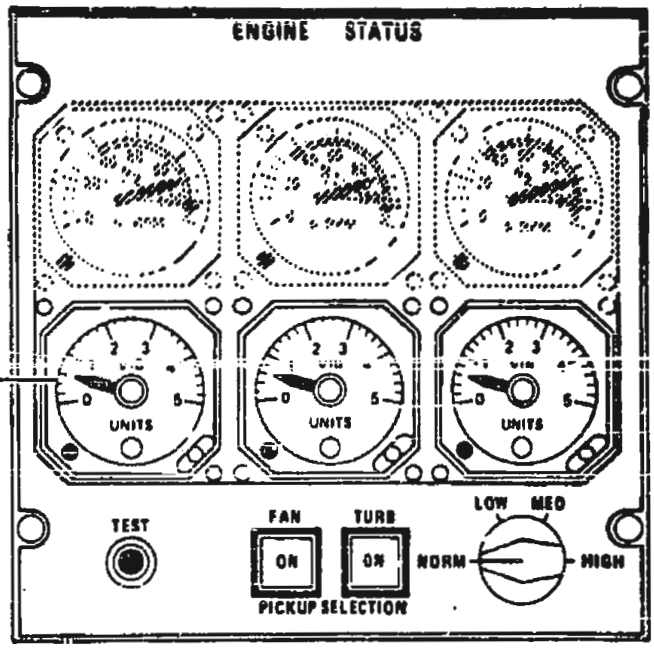
INSTRUMENT COOLING	2125
PACK FLOW CONTROL	2162
PACK FLOW MONITOR	2162
UNABLE TO MAINTAIN CABIN PRESSURE	2131
ZONE TEMPERATURE CONTROL	2161

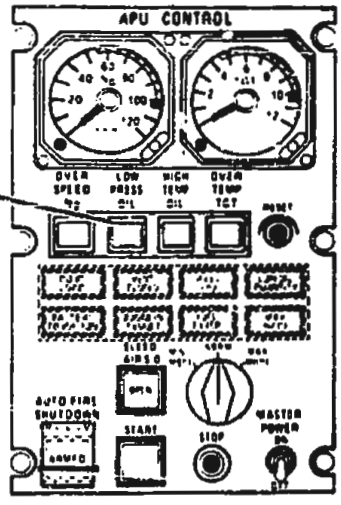
M1-0001-21-8006

R AIR CONDITION CONTENTS

EFFECTIVITY: ALL



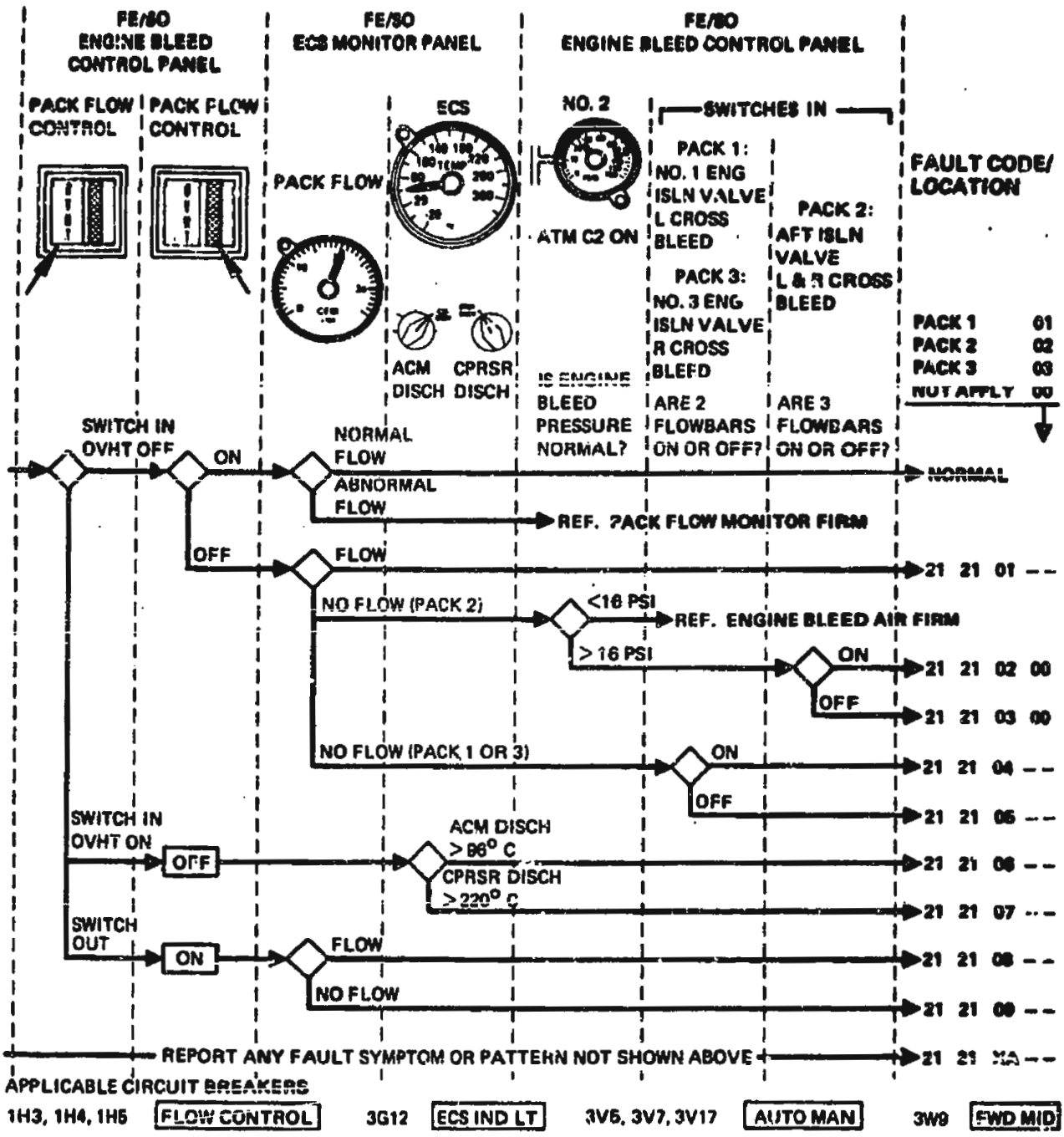
ENGINE STATUS PANEL



FE/SO APU CONTROL PANEL

TITLE CHAP/SEC
OIL FUMES OR
ODORS IN CABIN 2121

M1-0001-21-802L

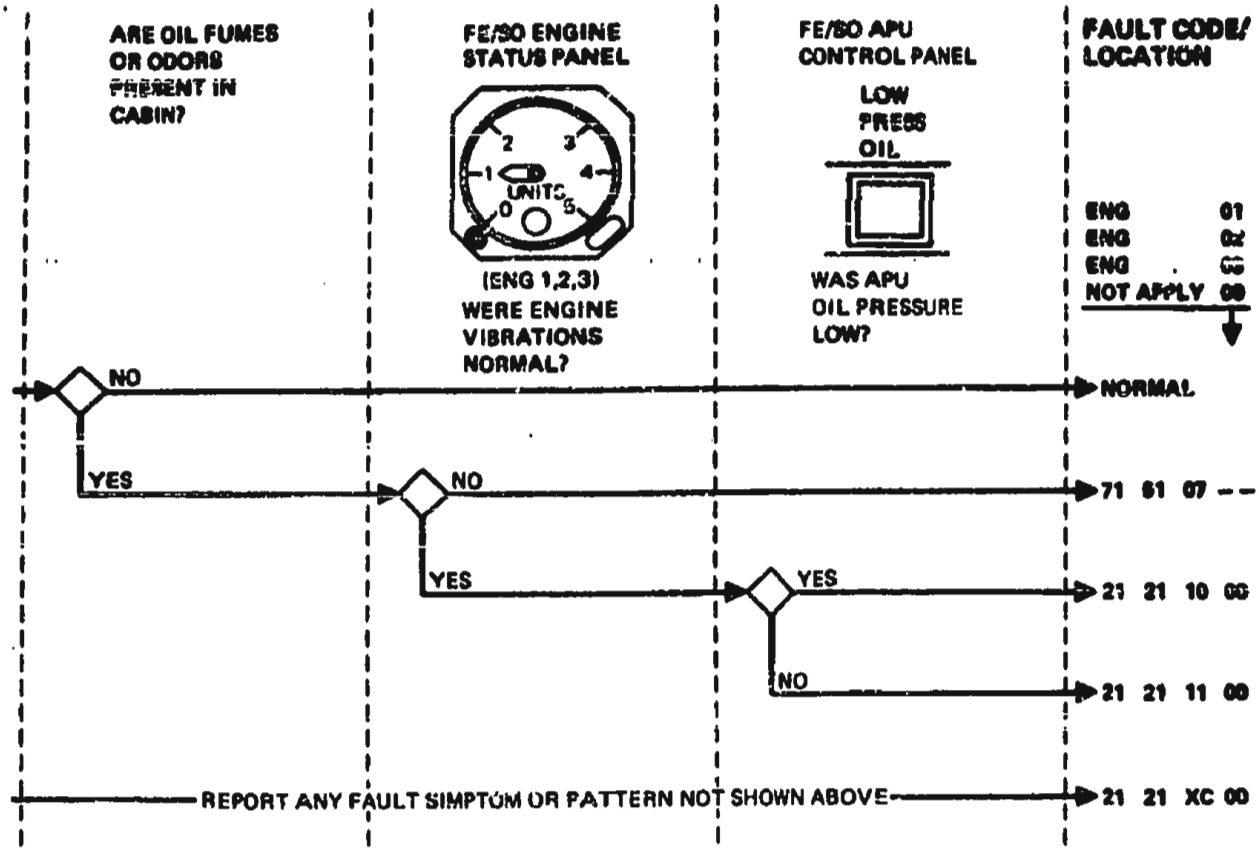


EDI-0012-81-404

R Pack Flow Control - Fault Codes
Figure 1

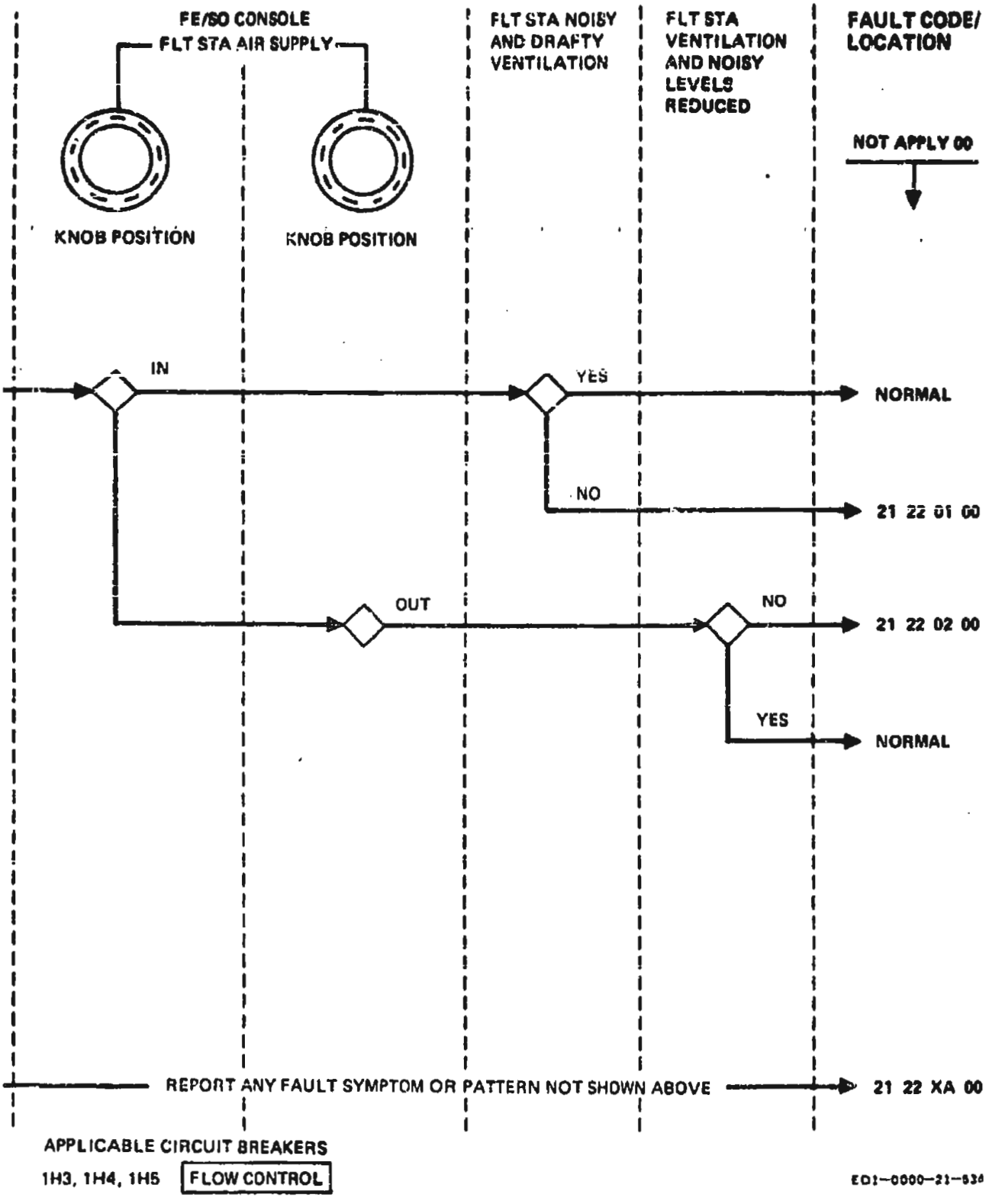
EFFECTIVITY: ALL

21-FAULT CODE DIAGRAM

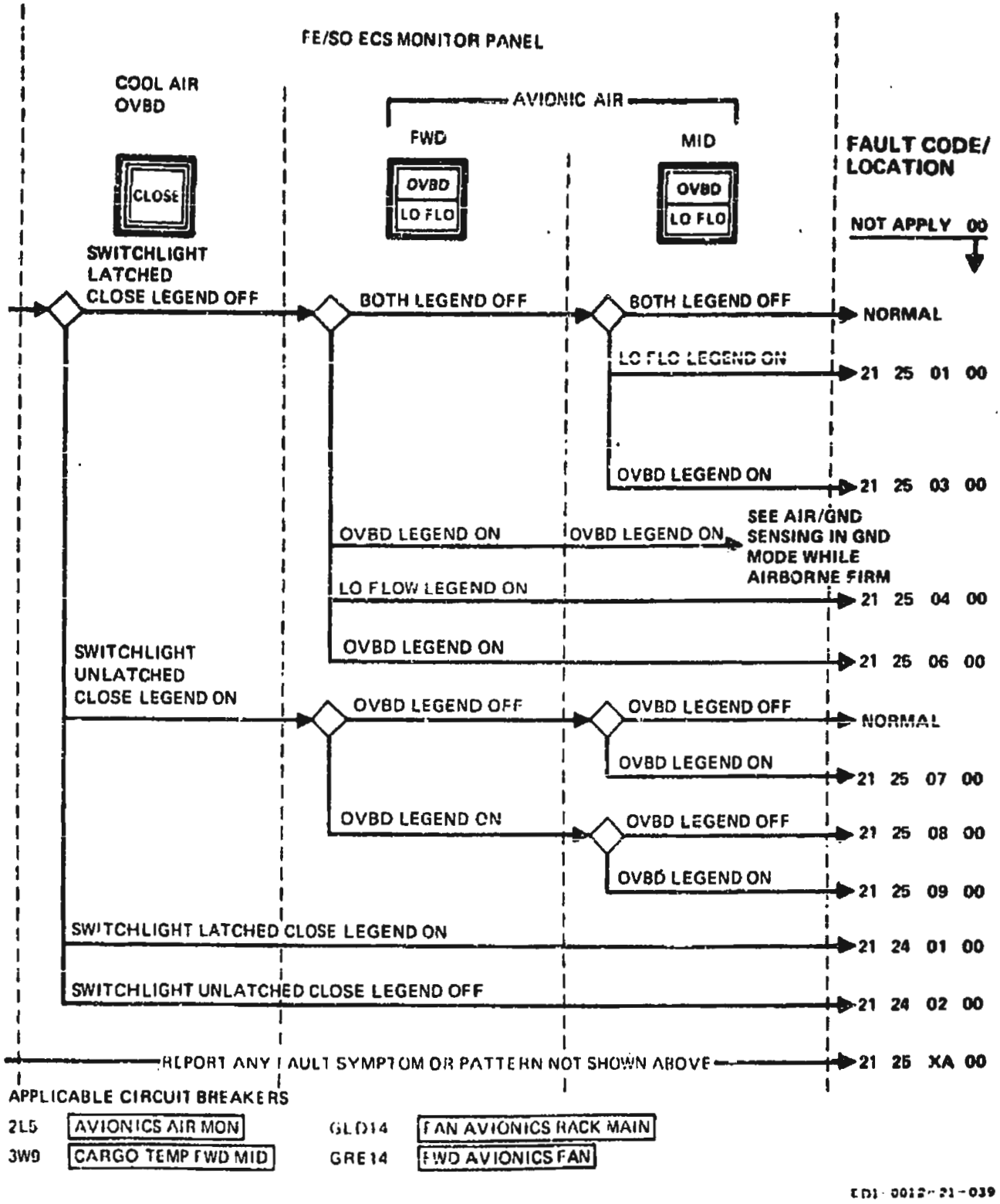


EDI-0000-21-038

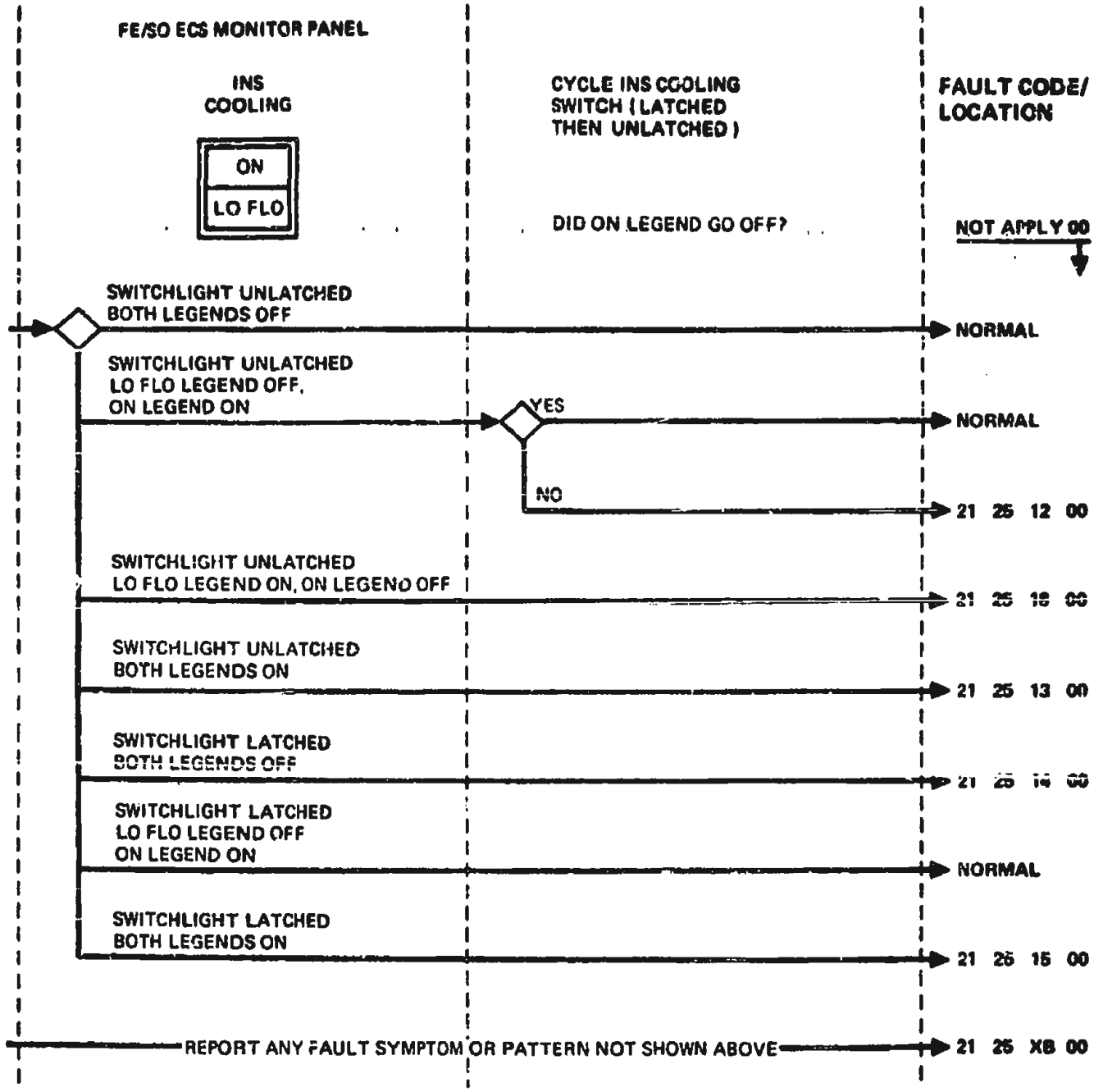
R Oil Fumes or Odors in Cabin - Fault Codes
Figure 2



Flight Station Cooling - Fault Codes
Figure 3



R Avionic Air Cooling - Fault Codes
Figure 4

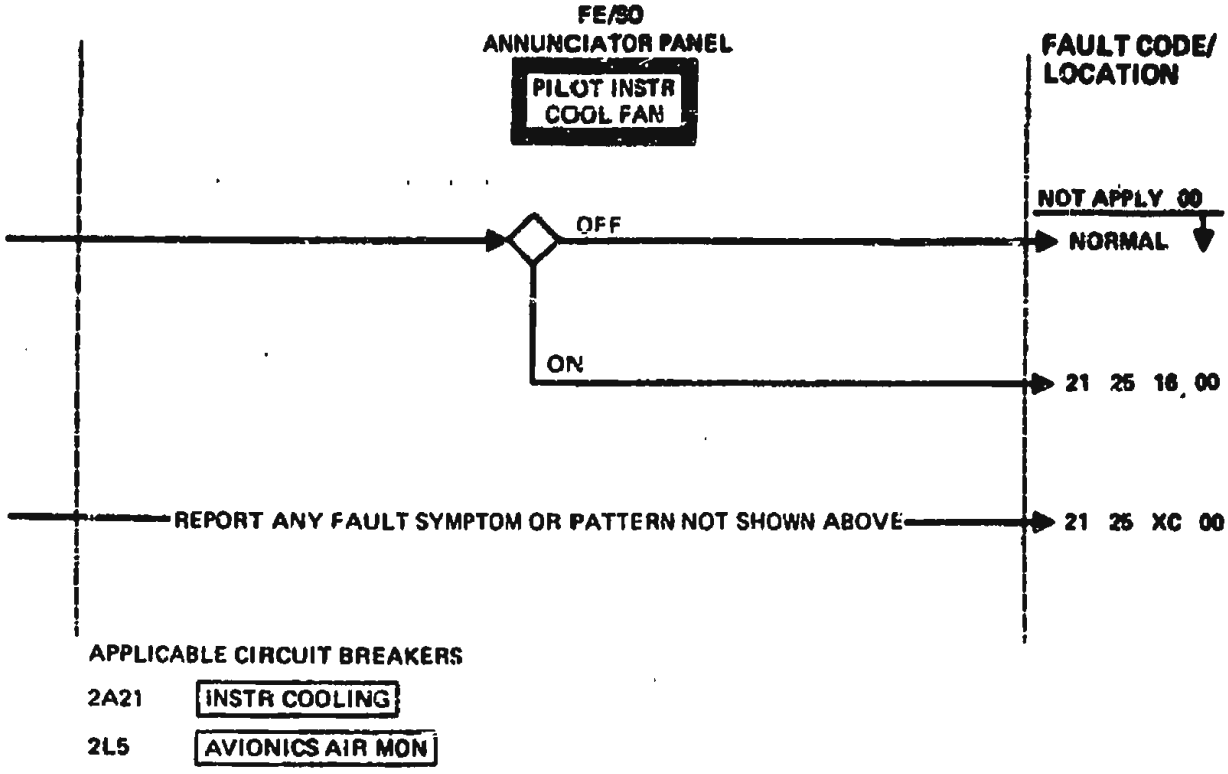

FE/SO ECS MONITOR PANEL
INS COOLING
ON
LO FLO
CYCLE INS COOLING SWITCH (LATCHED THEN UNLATCHED)
DID ON LEGEND GO OFF?
FAULT CODE/ LOCATION
NOT APPLY 00
SWITCHLIGHT UNLATCHED BOTH LEGENDS OFF
NORMAL
SWITCHLIGHT UNLATCHED LO FLO LEGEND OFF, ON LEGEND ON
YES
NORMAL
NO
21 25 12 00
SWITCHLIGHT UNLATCHED LO FLO LEGEND ON, ON LEGEND OFF
21 25 18 00
SWITCHLIGHT UNLATCHED BOTH LEGENDS ON
21 25 13 00
SWITCHLIGHT LATCHED BOTH LEGENDS OFF
21 25 14 00
SWITCHLIGHT LATCHED LO FLO LEGEND OFF ON LEGEND ON
NORMAL
SWITCHLIGHT LATCHED BOTH LEGENDS ON
21 25 15 00
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
21 25 XB 00

APPLICABLE CIRCUIT BREAKERS

3H6 INS COOLING FAN CONT
3H8 INS COOLING FAN POWER

ED1-0001-21-506

INS Cooling - Fault Codes
Figure 5

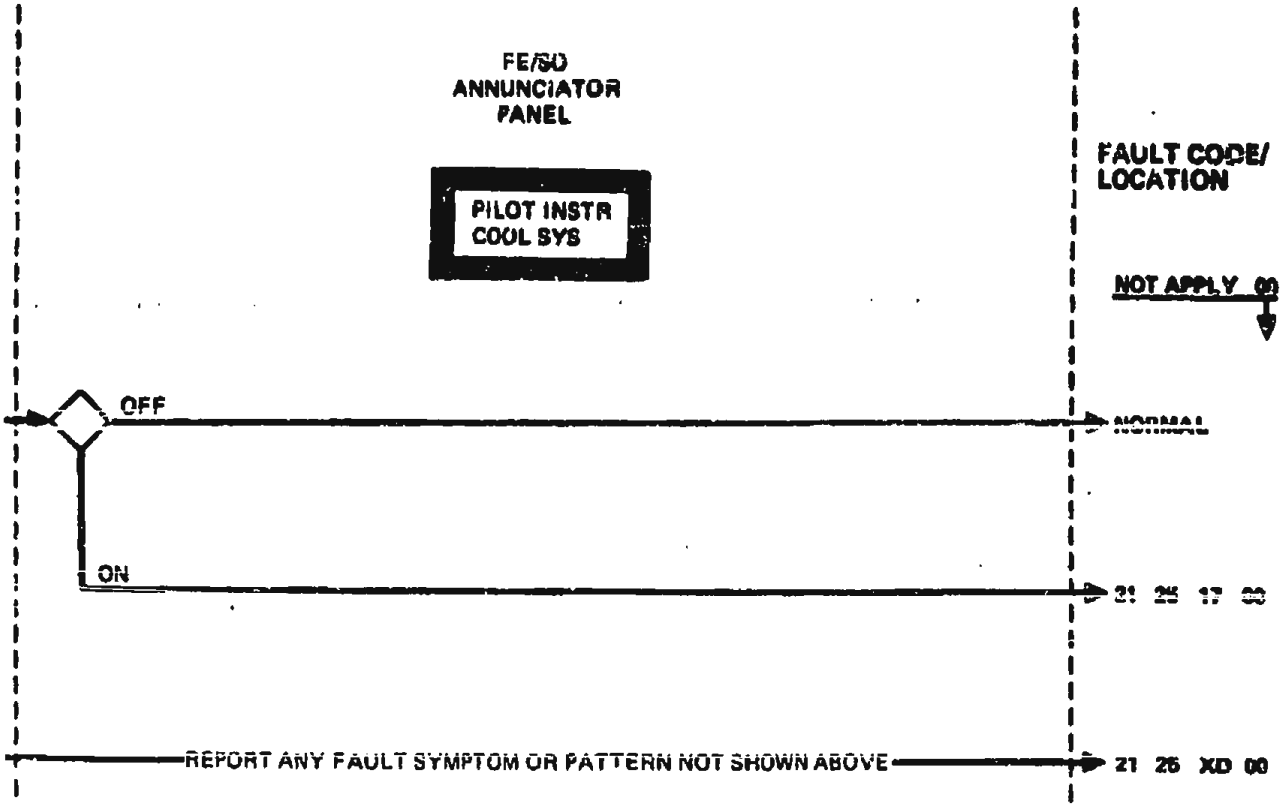


CDI-0002-21-328

R Instrument Cooling - Fault Codes
Figure 6

EFFECTIVITY: 001-031 (IF INSTALLED)

21-FAULT CODE DIAGRAM

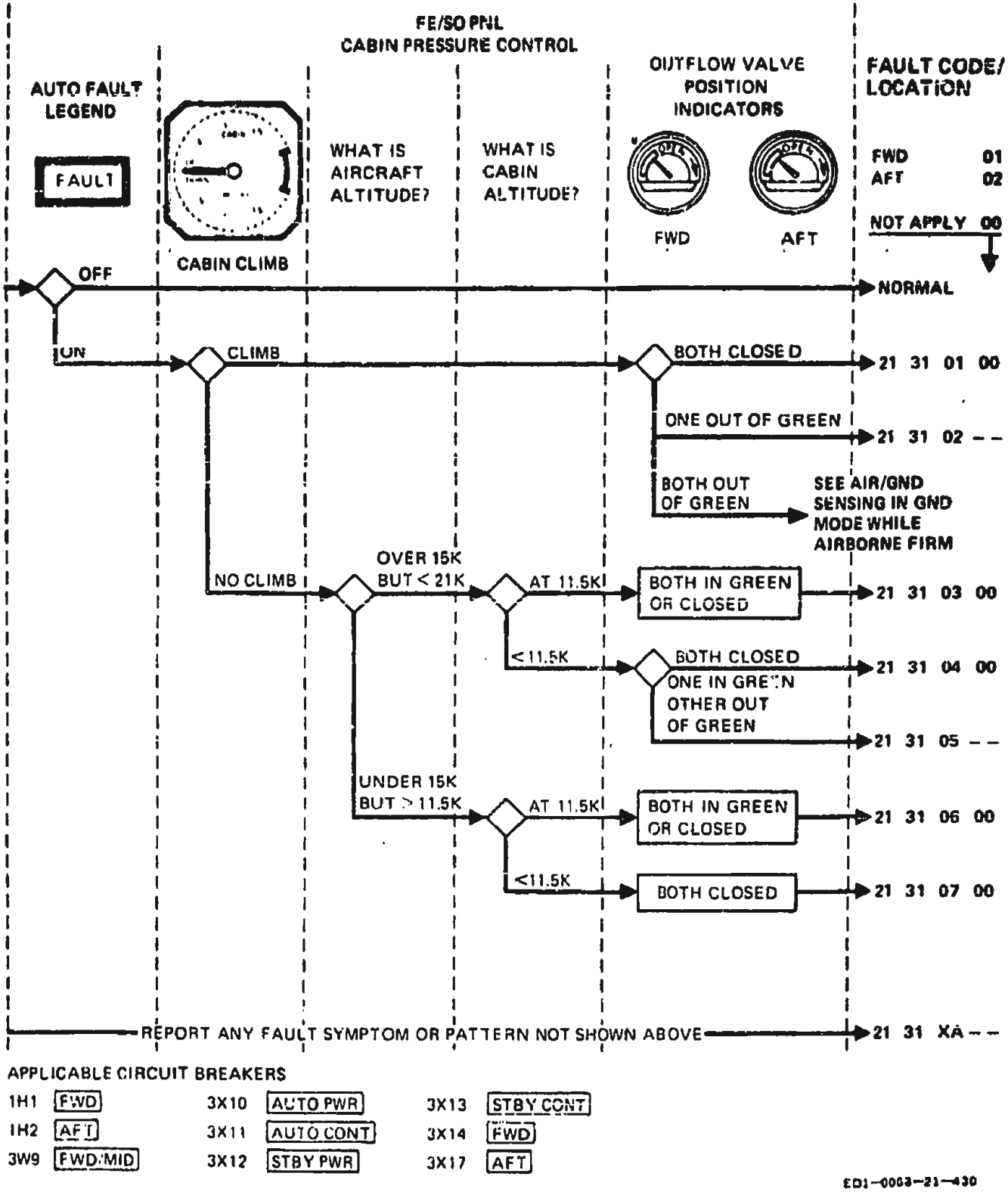


APPLICABLE CIRCUIT BREAKERS

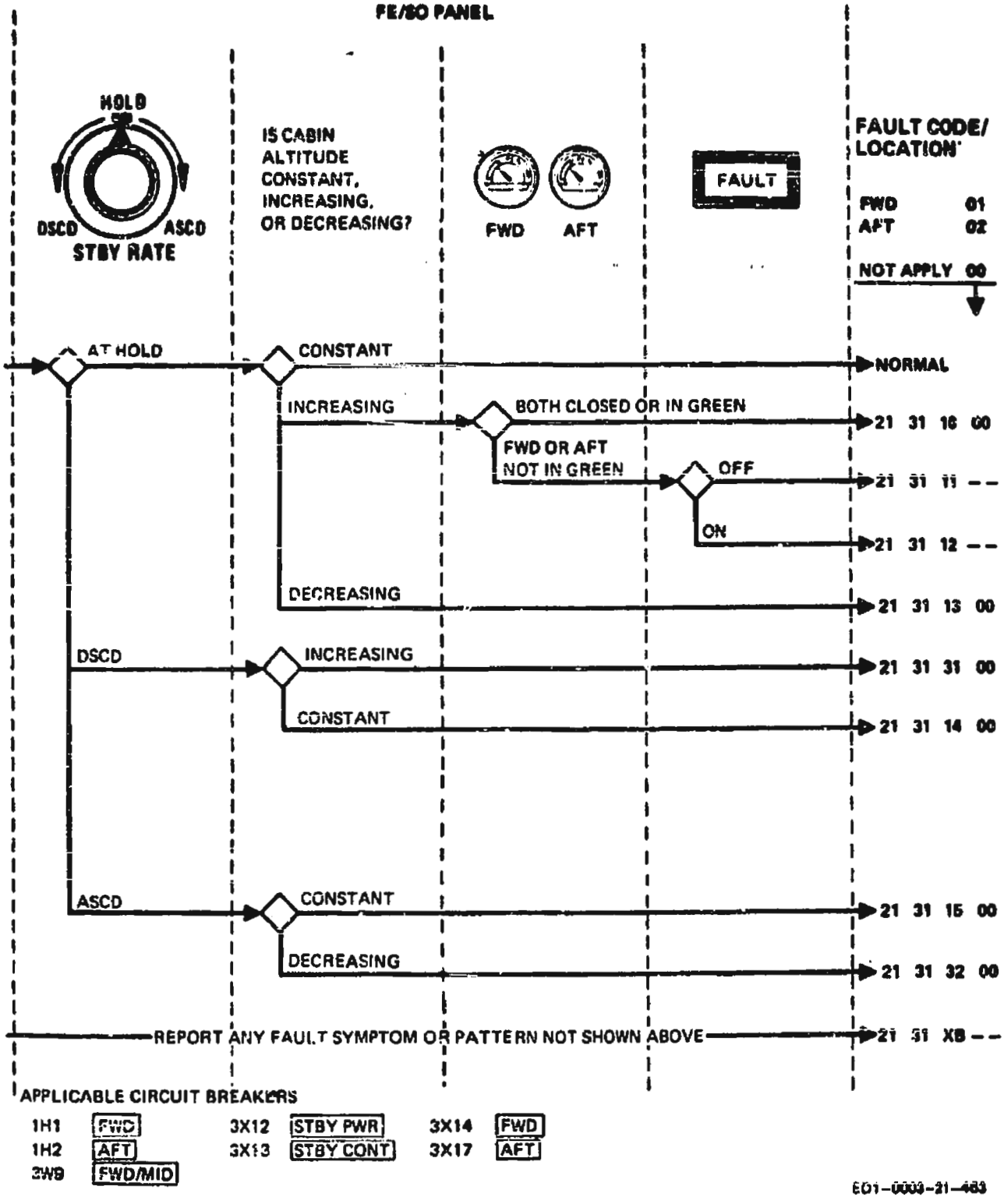
2A21	INSTR COOLING	2J1	INSTR GND COOL
2L5	AVIONICS AIR MON		

EDI-0000-21-057

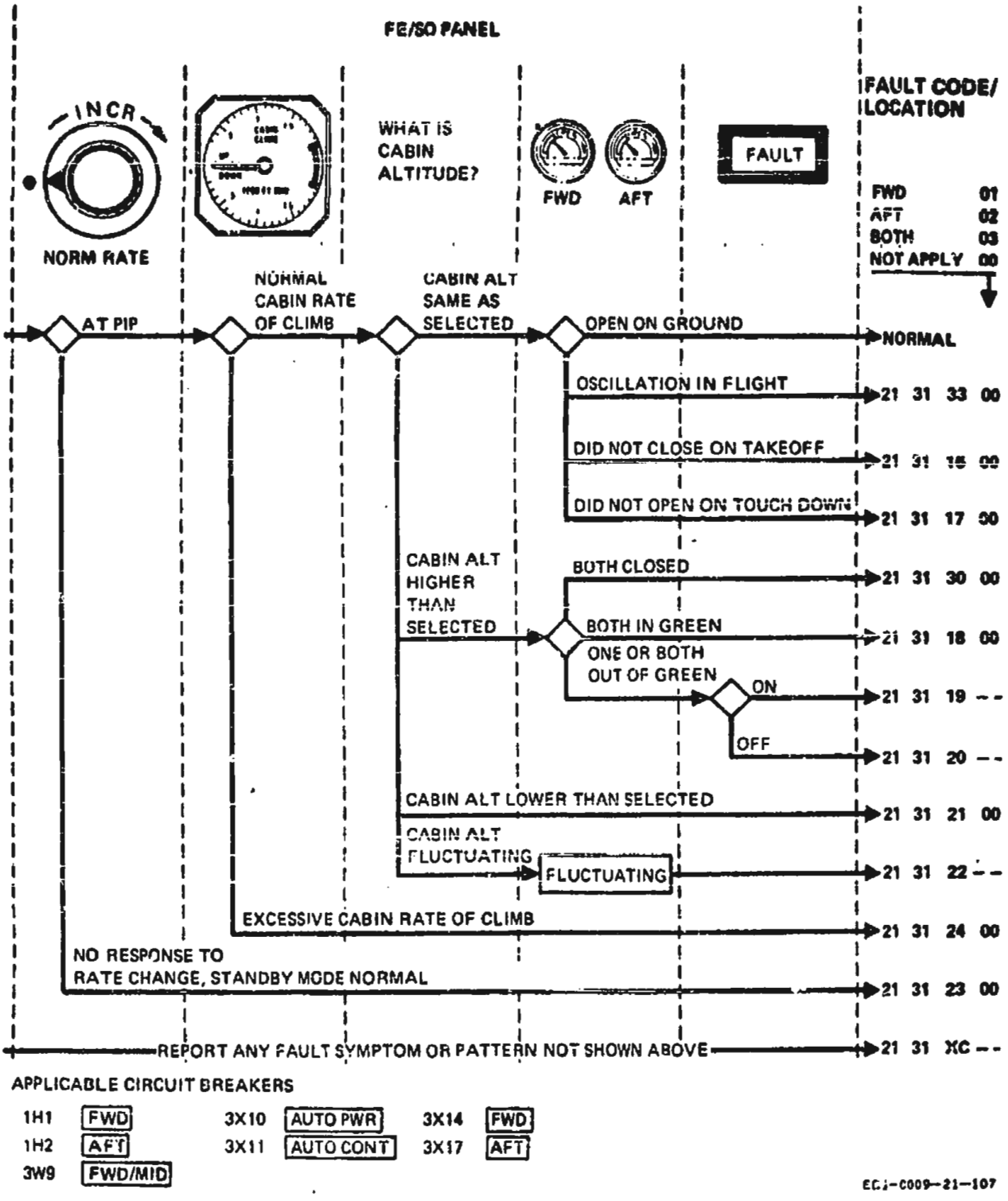
Instrument Cooling - Fault Codes
Figure 7



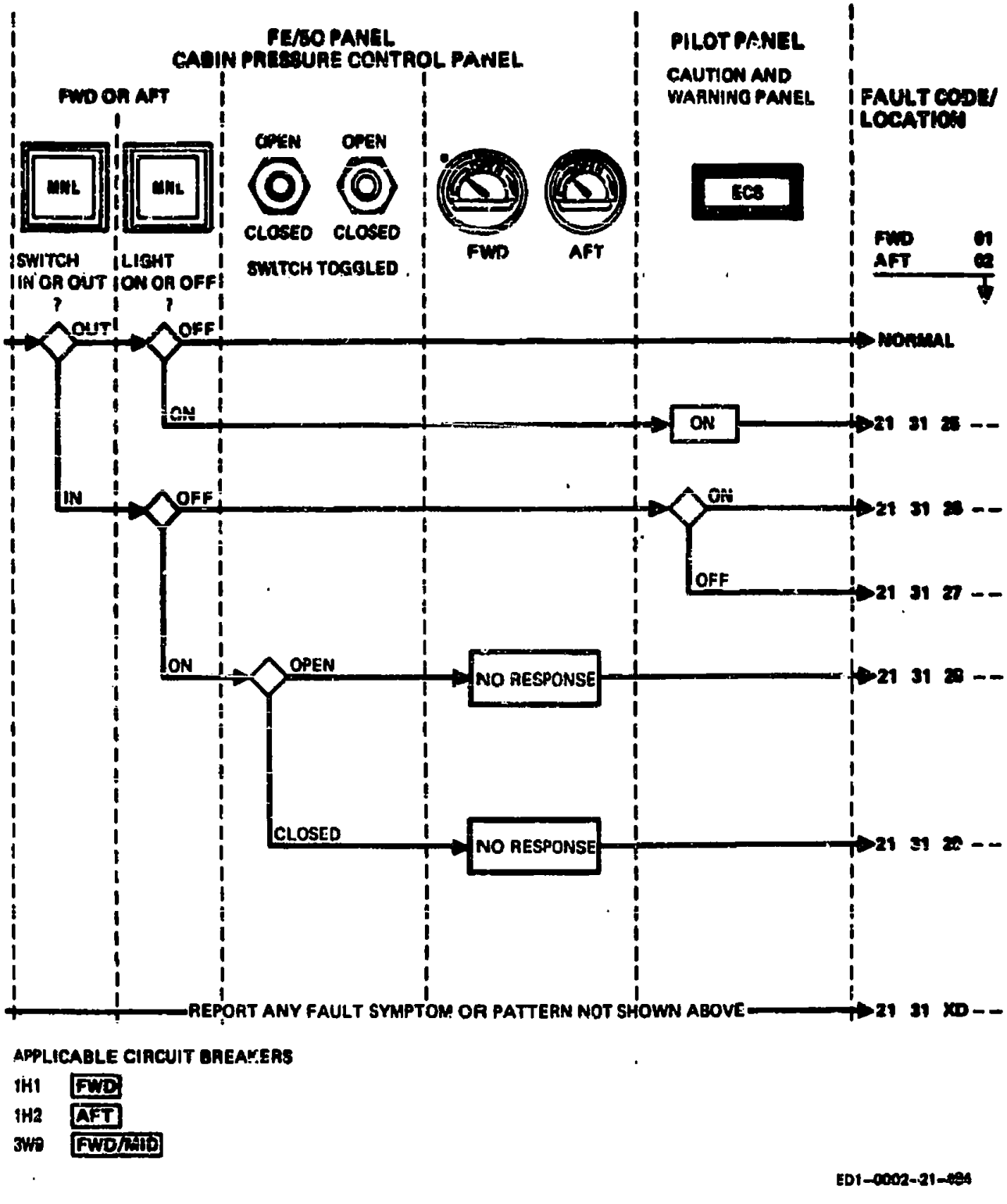
R Cabin Pressure, FAULT Legend - Fault Codes
Figure 8



Cabin Pressure, Standby Mode - Fault Codes
Figure 9



R Cabin Pressure, Normal Mode - Fault Codes
Figure 10

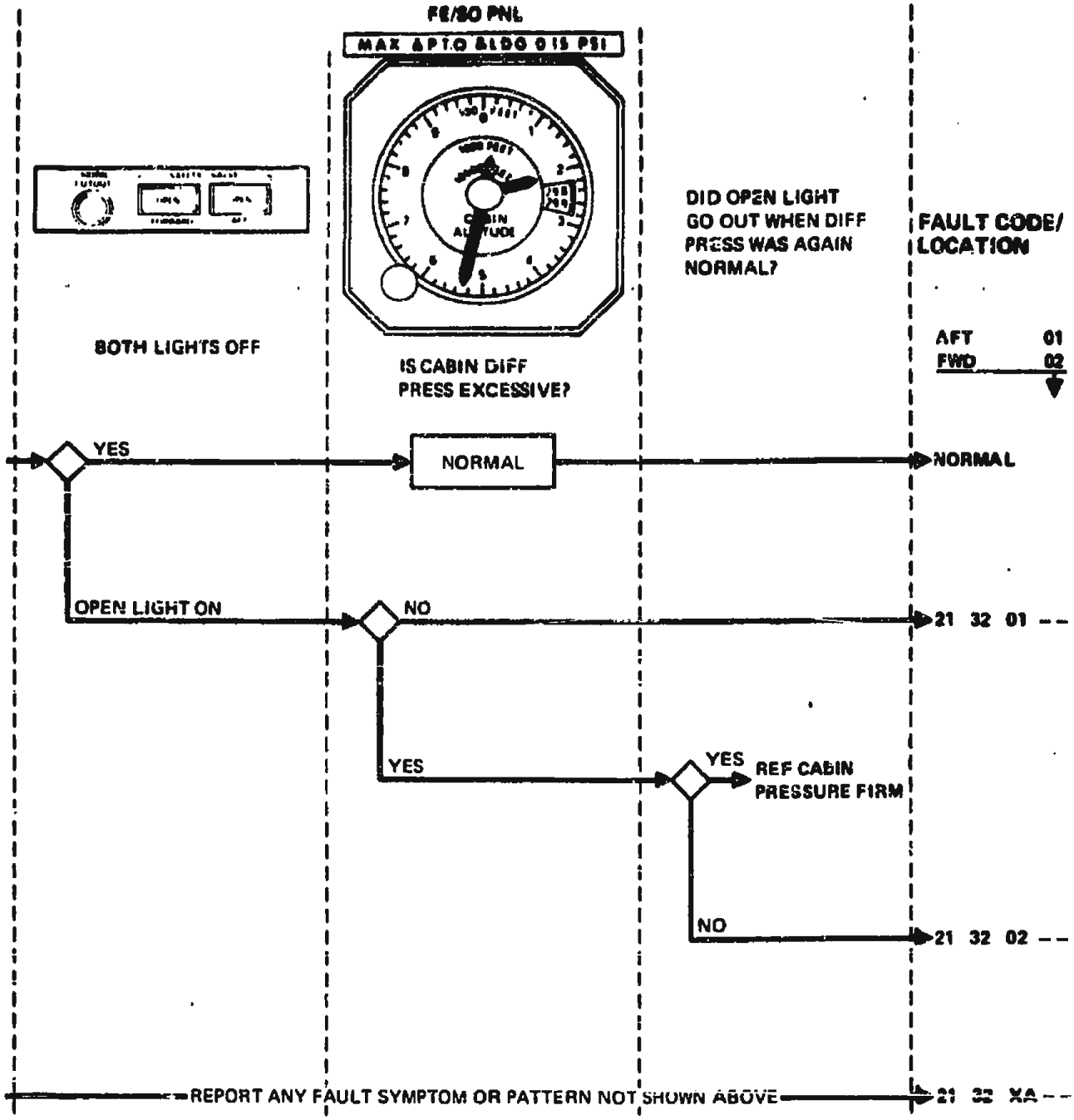


APPLICABLE CIRCUIT BREAKERS

1H1 FWD
1H2 AFT
3W9 FWD/MID

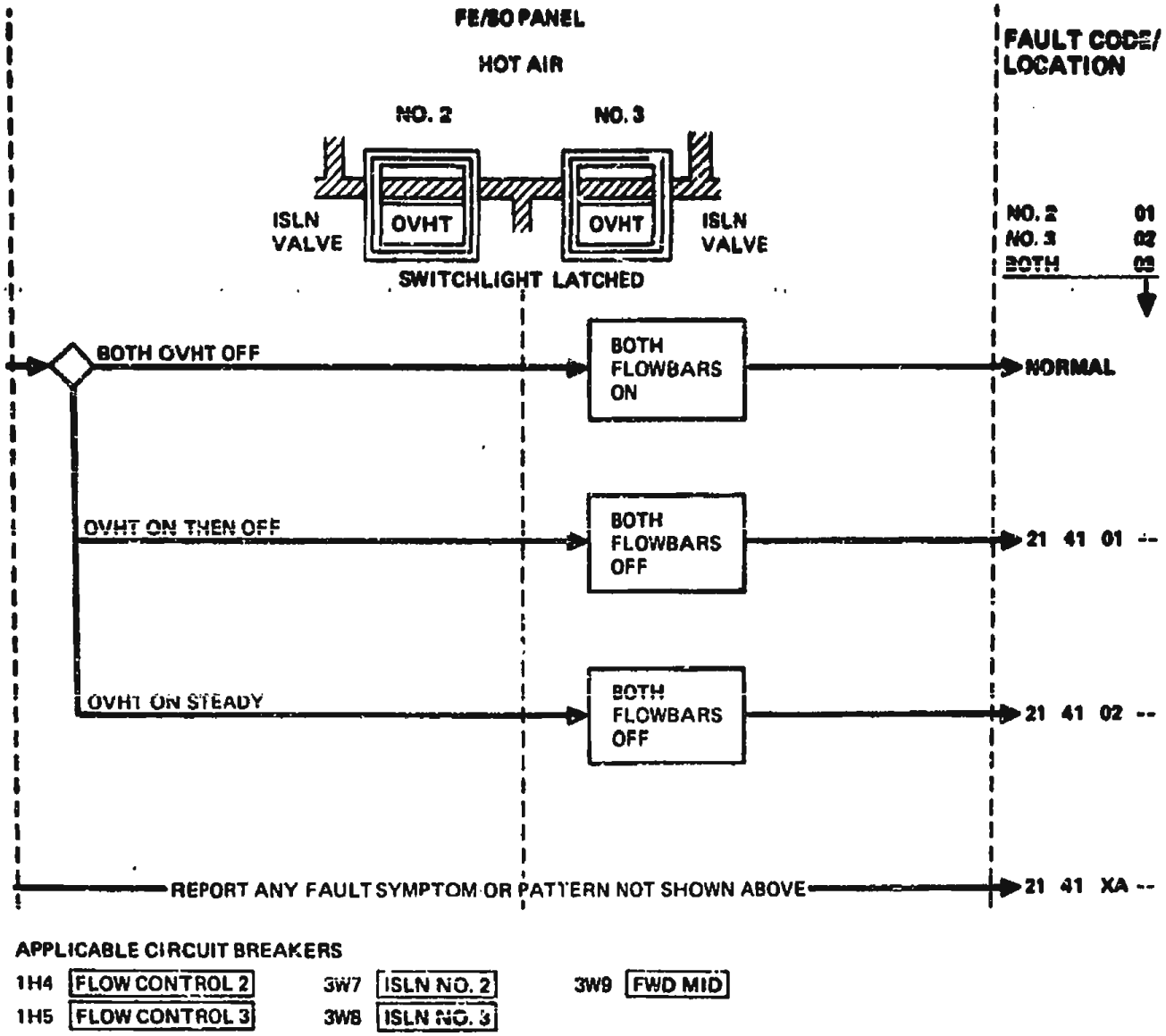
ED1-0002-21-494

Cabin Pressure, Manual Mode - Fault Codes
Figure 11



EDI-0001-21-485

Cabin Safety Valve - Fault Codes
Figure 12

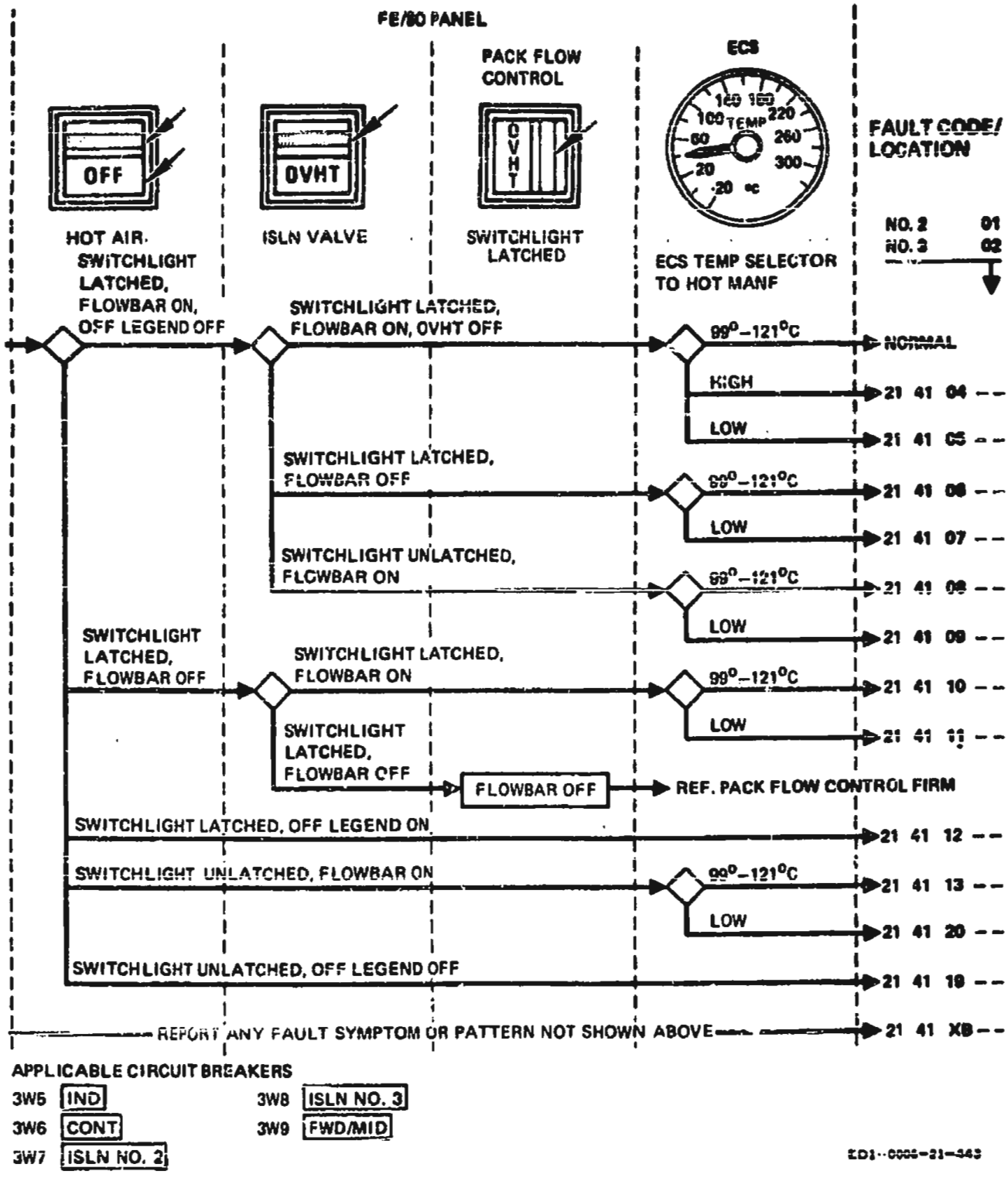


APPLICABLE CIRCUIT BREAKERS

1H4	FLOW CONTROL 2	3W7	ISLN NO. 2	3W9	FWD MID
1H5	FLOW CONTROL 3	3W8	ISLN NO. 3		

ED1-0008-21-002

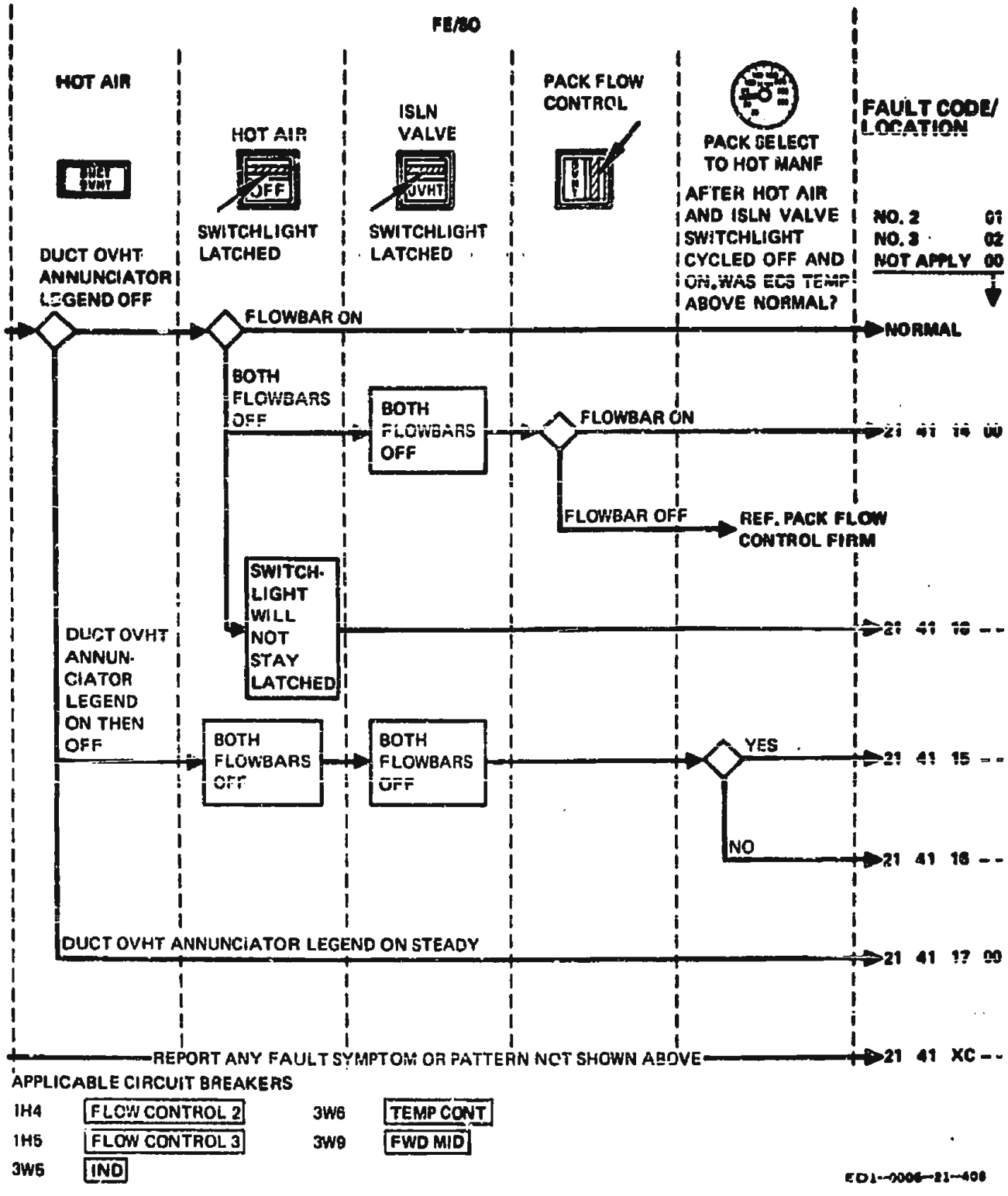
Hot Air Isln Valve OVHT Legend - Fault Codes
Figure 13



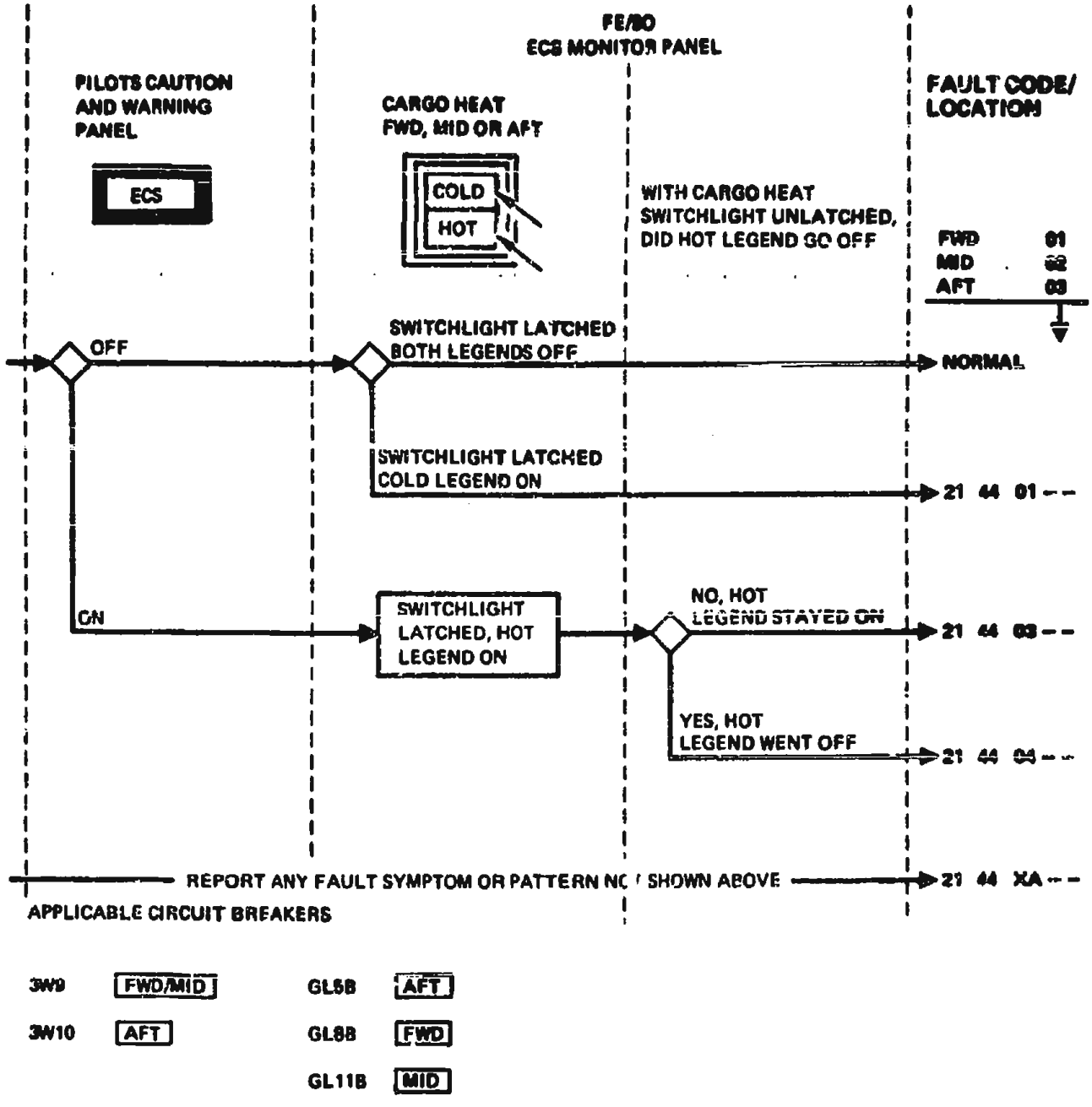
Hot Air System - Fault Codes
Figure 14

R EFFECTIVITY: ALL
R
050B

21-FAULT CODE DIAGRAM

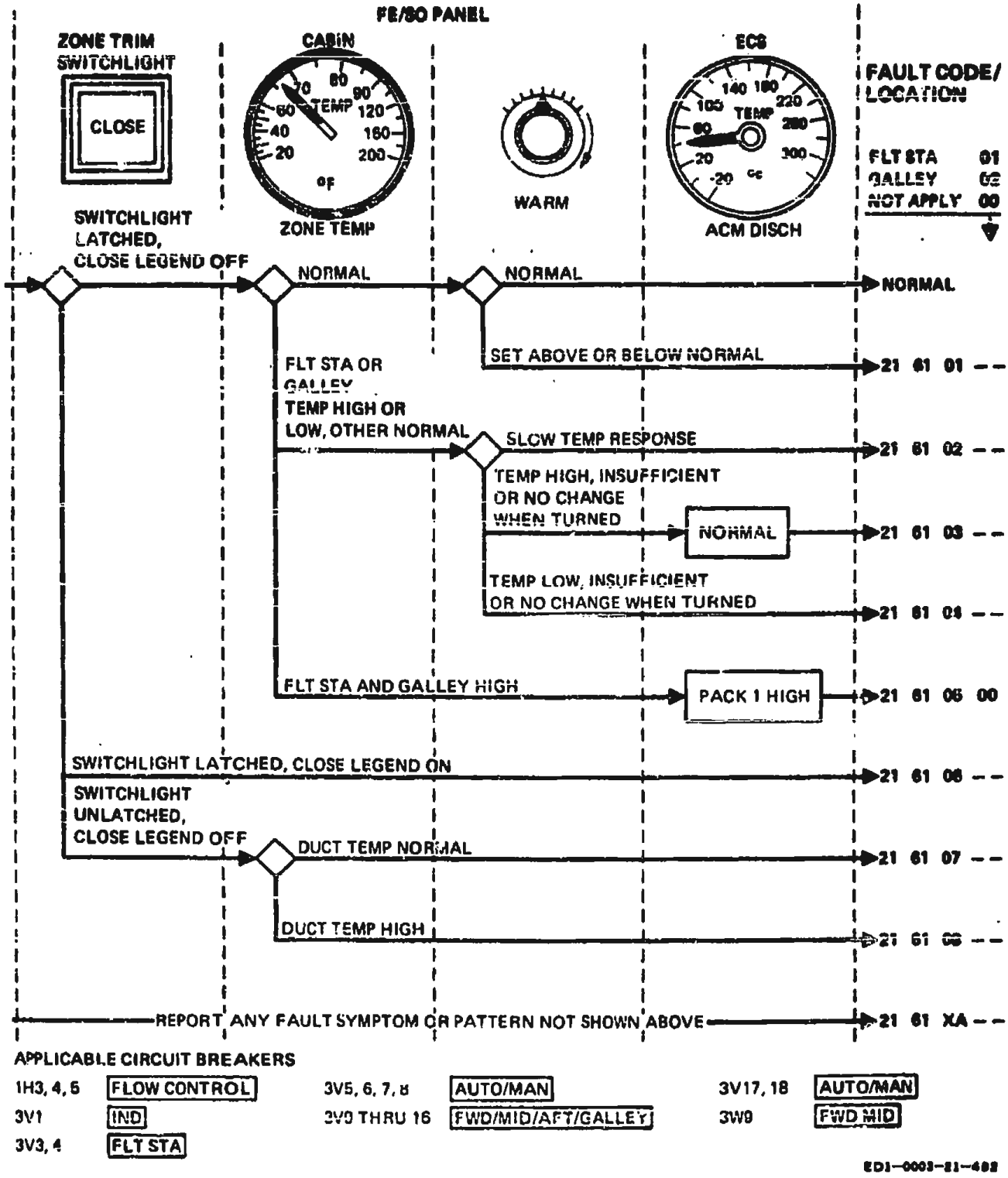


DUCT OVHT, Hot Air LEGEND - Fault Codes
Figure 15

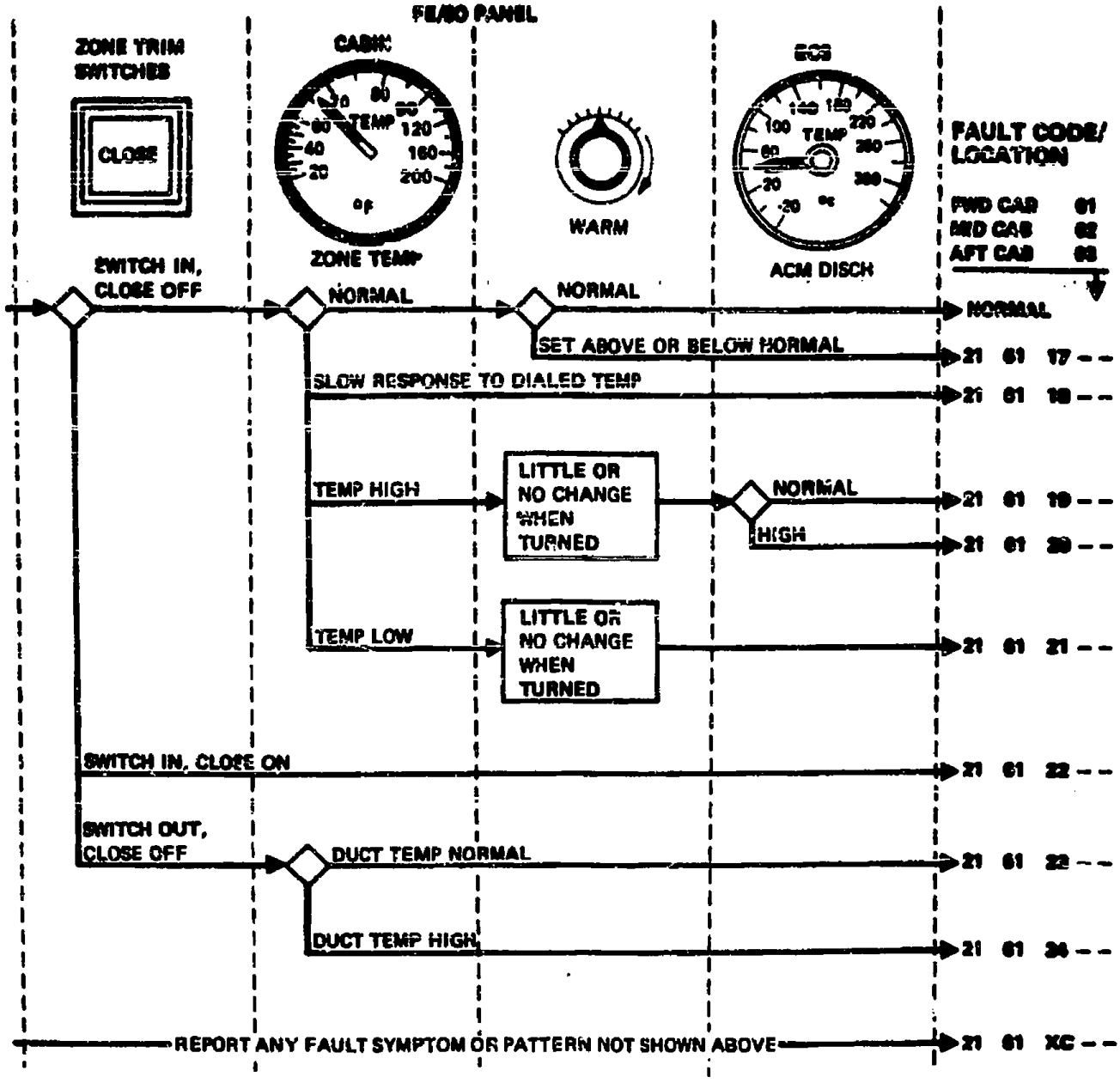


ED1-0001-21-B06

Cargo Heat COLD/HOT Legends - Fault Codes
Figure 16



Flight Station or Galley Temperature Control - Fault Codes
Figure 17

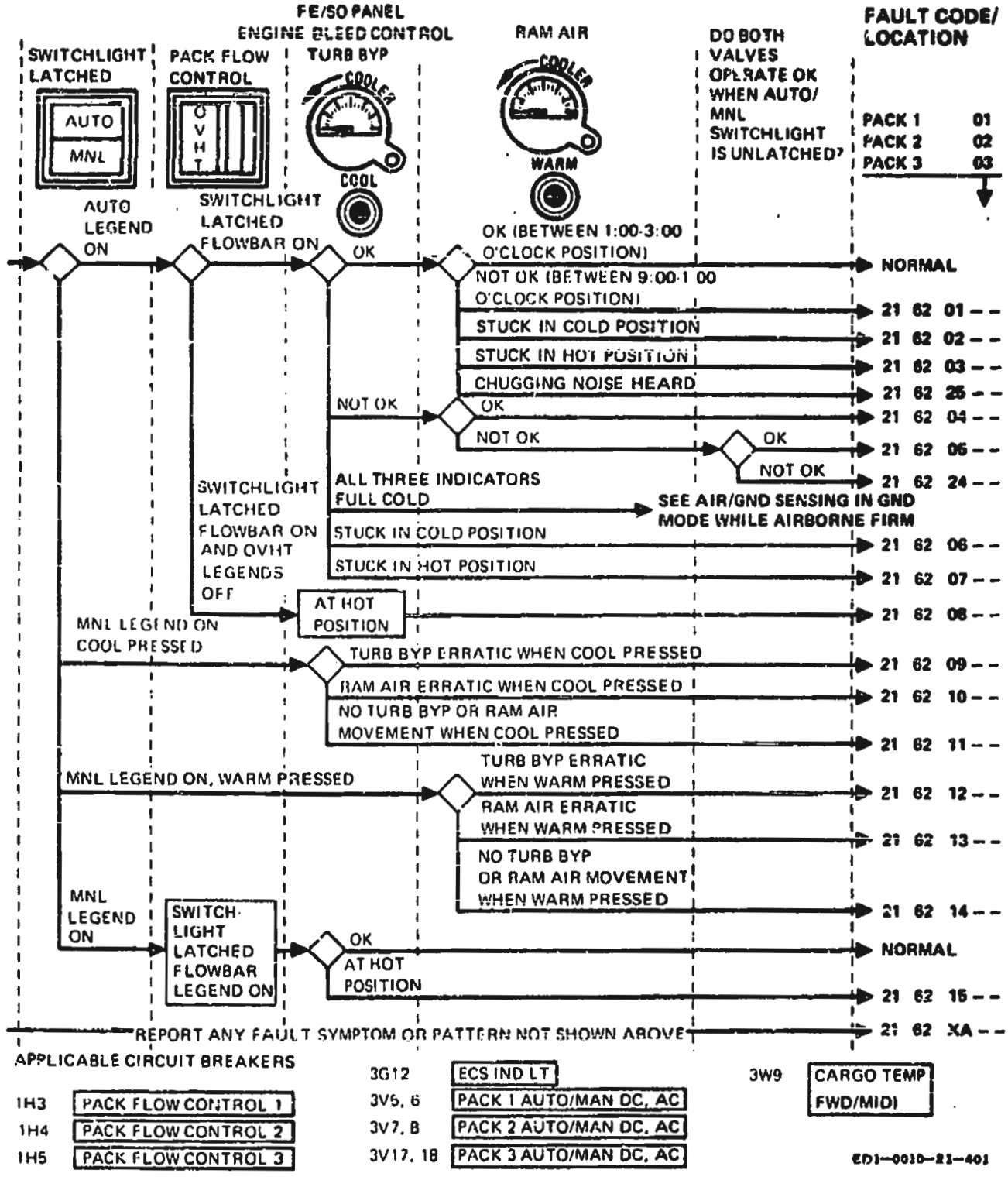


APPLICABLE CIRCUIT BREAKERS

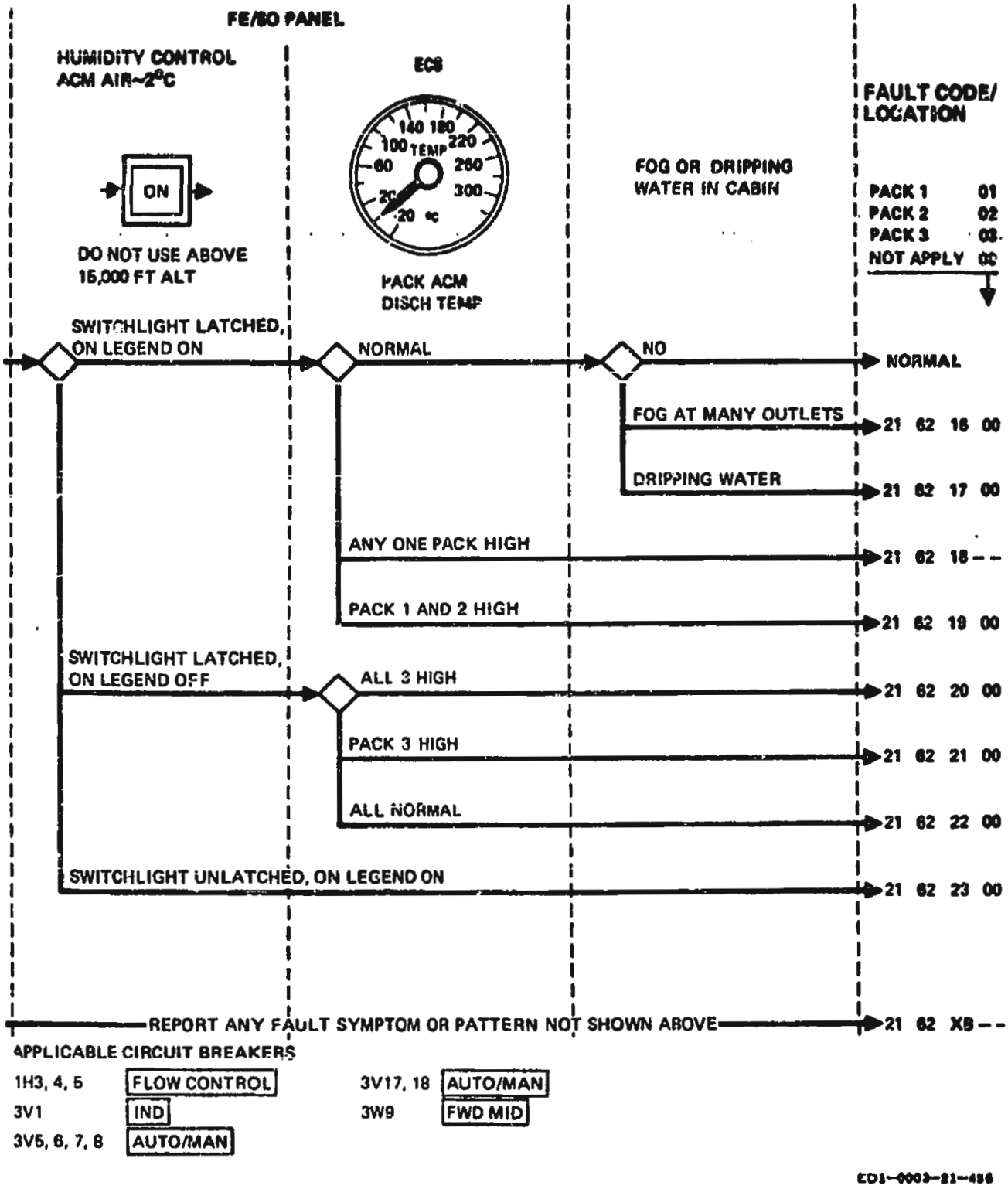
1H3, 4, 5	FLOW CONTROL	3V5, 6, 7, 8	AUTO/MAN	3V9, 10	FWD MID/AFT
3V1	IND	3V9 THRU 16	FWD, MID, AFT CAB/GALLEY		
3V3, 4	FLT STA	3V17, 18	AUTO/MAN		

ED1-0000-21-814

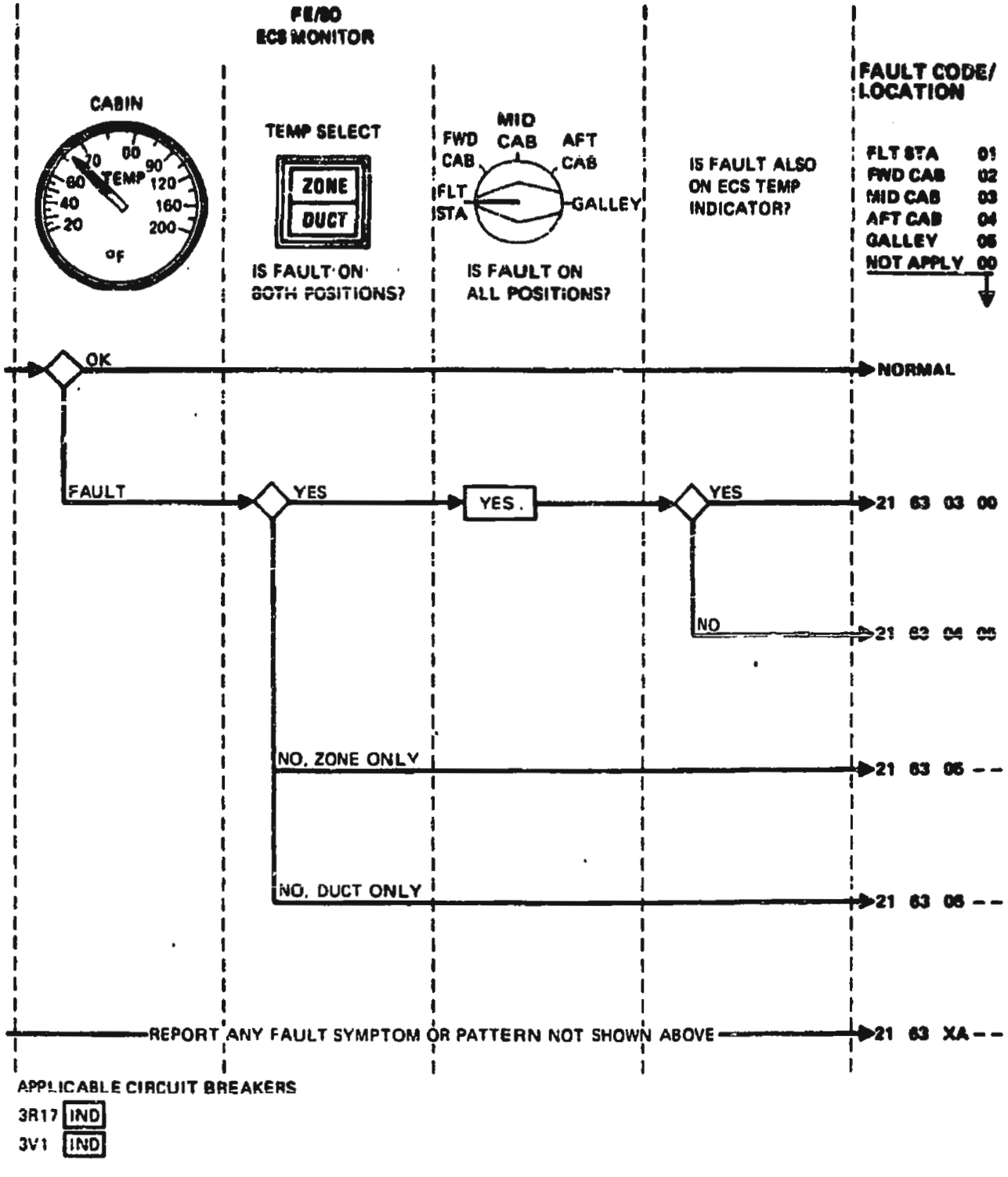
Cabin Temperature Control - Fault Codes
Figure 18


FE/SO PANEL
ENGINE BLEED CONTROL
SWITCHLIGHT LATCHED
AUTO
MNL
PACK FLOW CONTROL
OVHT
TURB BYP
COOLER
COOL
RAM AIR
COOLER
WARM
DO BOTH VALVES OPERATE OK WHEN AUTO/MNL SWITCHLIGHT IS UNLATCHED?
FAULT CODE/ LOCATION
PACK 1 01
PACK 2 02
PACK 3 03
AUTO LEGEND ON
SWITCHLIGHT LATCHED FLOWBAR ON
OK
OK (BETWEEN 1:00-3:00 O'CLOCK POSITION)
NORMAL
NOT OK (BETWEEN 9:00-1:00 O'CLOCK POSITION)
21 62 01 - -
STUCK IN COLD POSITION
21 62 02 - -
STUCK IN HOT POSITION
21 62 03 - -
CHUGGING NOISE HEARD
21 62 25 - -
NOT OK
OK
21 62 04 - -
NOT OK
OK
21 62 05 - -
NOT OK
21 62 24 - -
SWITCHLIGHT LATCHED FLOWBAR ON AND OVHT LEGENDS OFF
ALL THREE INDICATORS FULL COLD
SEE AIR/GND SENSING IN GND MODE WHILE AIRBORNE FIRM
STUCK IN COLD POSITION
21 62 06 - -
STUCK IN HOT POSITION
21 62 07 - -
AT HOT POSITION
21 62 08 - -
MNL LEGEND ON COOL PRESSED
TURB BYP ERRATIC WHEN COOL PRESSED
21 62 09 - -
RAM AIR ERRATIC WHEN COOL PRESSED
21 62 10 - -
NO TURB BYP OR RAM AIR MOVEMENT WHEN COOL PRESSED
21 62 11 - -
MNL LEGEND ON, WARM PRESSED
TURB BYP ERRATIC WHEN WARM PRESSED
21 62 12 - -
RAM AIR ERRATIC WHEN WARM PRESSED
21 62 13 - -
NO TURB BYP OR RAM AIR MOVEMENT WHEN WARM PRESSED
21 62 14 - -
MNL LEGEND ON
SWITCHLIGHT LATCHED FLOWBAR LEGEND ON
OK
AT HOT POSITION
NORMAL
21 62 15 - -
REPORT ANY FAULT SYMPTOM OR PATTERN NOT SHOWN ABOVE
21 62 XA - -
APPLICABLE CIRCUIT BREAKERS
1H3 PACK FLOW CONTROL 1
1H4 PACK FLOW CONTROL 2
1H5 PACK FLOW CONTROL 3
3G12 ECS IND LT
3V5, 6 PACK 1 AUTO/MAN DC, AC
3V7, 8 PACK 2 AUTO/MAN DC, AC
3V17, 18 PACK 3 AUTO/MAN DC, AC
3W9 CARGO TEMP FWD/MID
ED1-0010-21-401

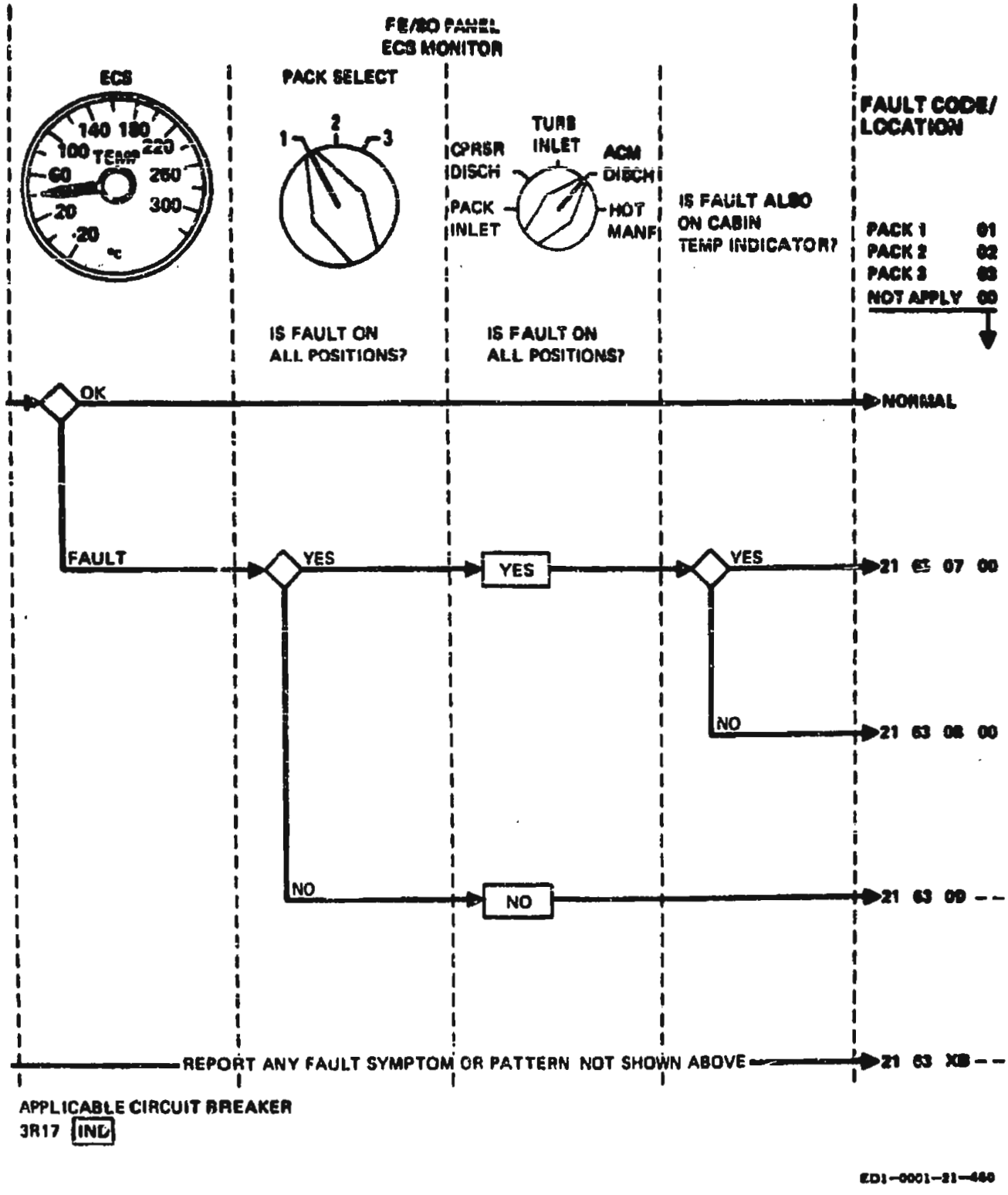
R Auto/Manual Pack Operation - Fault Codes
Figure 19



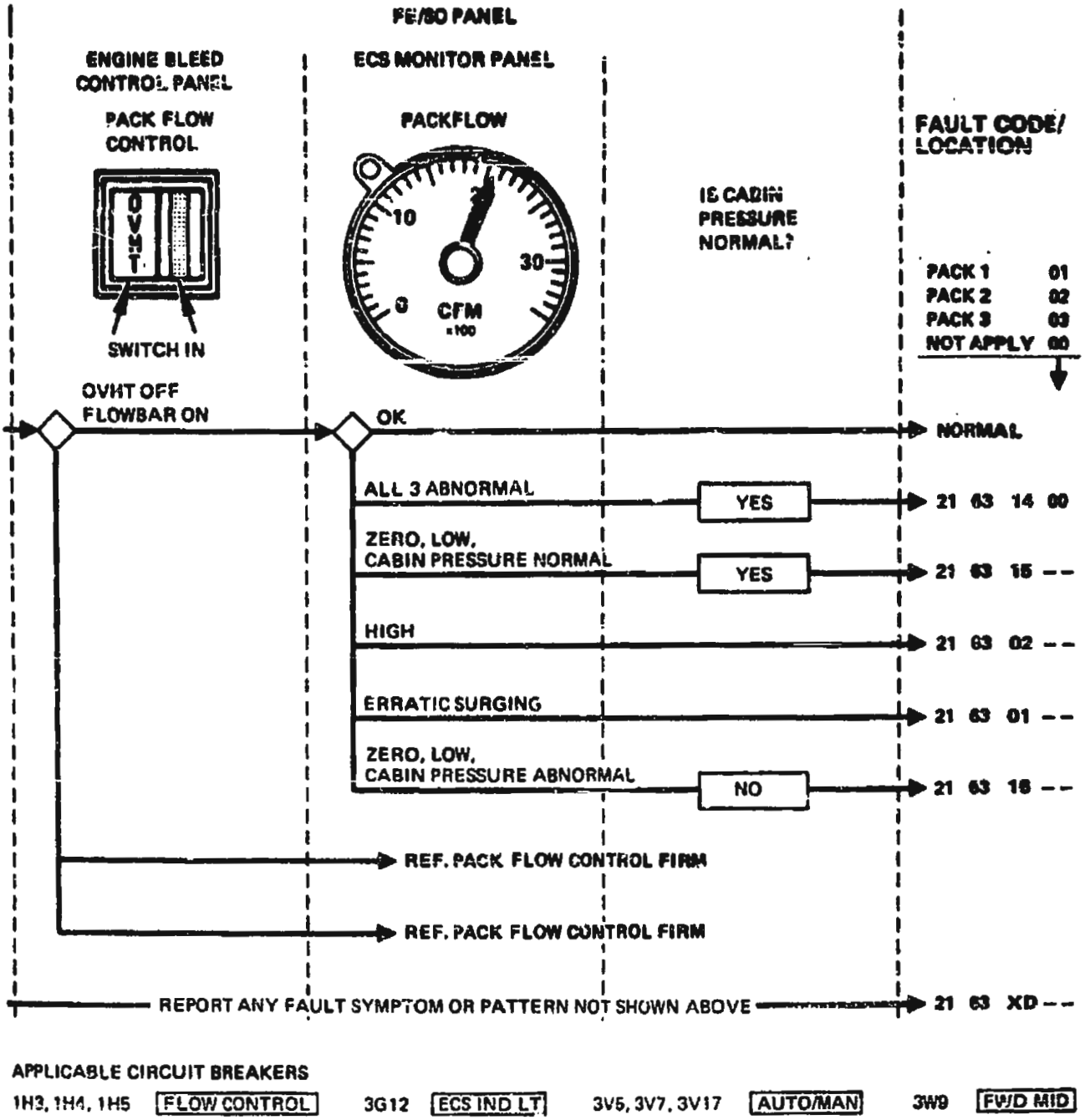
Humidity Control - Fault Codes
Figure 20



Cabin Temperature Monitor - Fault Codes
Figure 21



ECS Temperature Monitor - Fault Codes
Figure 22



APPLICABLE CIRCUIT BREAKERS

1H3, 1H4, 1H5 [FLOW CONTROL] 3G12 [ECS IND LT] 3V5, 3V7, 3V17 [AUTO/MAN] 3W9 [FWD MID]

ED1-0001-21-009

Pack Flow Monitor - Fault Codes
Figure 23

FAULT CODE INDEX
TABLE 1

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
R 21 21 XC 00	1. An Oil Fumes or Odors in Cabin fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R	2. 21-21-00 Fig. 106 Block 1
21 22 XA 00	1. A Flight Station Cooling fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-22-00 Fig. 103 Block 1
21 25 XA 00	1. An Avionic Air Cooling fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-24-00 Fig. 103 Block 1 21-25-00 Fig. 103 (Sheet 1, 2) Block 1 21-25-00 Fig. 104 (Sheet 1, 2) Block 1
21 25 XB 00	1. An INS Cooling fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-25-00 Fig. 105 Block 1 (Sheet 1)
21 25 XC 00	1. An Instrument Cooling fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-25-00 Fig. 106 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 25 XD 00	1. An Instrument Cooling fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-25-00 Fig. 106 Block 1
21 31 XA __	1. A Cabin Pressure, FAULT Legend fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-31-00 Fig. 104, 105 Block 1
21 31 XB __	1. A Cabin Pressure, Standby Mode fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-31-00 Fig. 104, 105 Block 1
21 31 XC __	1. A Cabin Pressure, Normal Mode fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-31-00 Fig. 103, 104, 105, 107 Block 1
21 31 XD __	1. A Cabin Pressure, Manual Mode fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-31-00 Fig. 105, 106 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 32 XA __	1. A Cabin Safety Valve fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-32-00 SCHEM 1
21 41 XA __	1. An Hot Air Isln Valve OVHT Legend fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-41-00 Fig. 107 Block 1
21 41 XB __	1. An Hot Air System fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-41-00 Fig. 104 thru 106, 108 thru 110 Block 1
21 41 XC __	1. A DUCT OVHT, Hot Air LEGEND fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-41-00 Fig. 103, 104 Block 1
21 44 XA __	1. A Cargo Heat COLD/HOT Legends fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.) 2. 21-44-00 Fig. 103, 104 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 61 XA __	1. A Flight Station or Galley Temperature Control fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R R	2. 21-61-00 Fig. 103 (Sheet 1) and (Sheet 2), Fig. 105 Block 1
21 61 XC __	1. A Cabin Temperature Control fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R R	2. 21-61-00 Fig. 104 (Sheet 1) and (Sheet 2), Fig. 105, Block 1
21 62 XA __	1. An Auto/Manual Pack Operation fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
R R	2. 21-62-00 Fig. 103 (Sheet 1) and (Sheet 2) Block 1
21 62 XB __	1. An Humidity Control fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-62-00 Fig. 104 Block 1
21 63 XA __	1. A Cabin Temperature Monitor fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-63-00 Fig. 103 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 63 XB __	1. An ECS Temperature Monitor fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-63-00 Fig. 104 Block 1
21 63 XD __	1. A Pack Flow Monitor fault was encountered by the crew which is not covered in the fault code diagram. (Ref. Fault Code diagram for flight crew actions.)
	2. 21-63-00 Fig. 105 Block 1
21 21 01 __	1. (01=PACK 1, 02=PACK 2, 03=PACK 3) FLOW CONTROL switch in, OVHT off, flowbar off. Pack flow normal.
	2. 21-21-00 Fig. 104 (Sheet 1) Block 2
21 21 02 00	1. PACK 2 FLOW CONTROL switch in, OVHT off, flowbar off, no pack flow. Engine bleed pressure OK, AFT ISLN and LEFT and RIGHT CROSS BLEED flowbars on.
	2. 21-21-00 Fig. 104 (Sheet 2) Block 2
21 21 03 00	1. PACK 2 FLOW CONTROL switch in, OVHT off, flowbar off, no pack flow. Engine bleed pressure OK. AFT ISLN and LEFT and RIGHT CROSS BLEED flowbars off.
	2. 36-14-00 Fig. 104 (Sheet 1) Block 1
21 21 04 __	1. (01=Pack 1, 03=Pack 3) FLOW CONTROL switch in, OVHT off, flowbar off, no pack flow. ENG ISLN VALVE and both CROSS BLEED flowbars on.
	2. 21-21-00 Fig. 104 (Sheet 1) Block 4

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 21 05 __	1. (01=Pack 1, 03=Pack 3) FLOW CONTROL switch in, OVHT off, flowbar off, no pack flow. ENG ISLN VALVE and CROSS BLEED flowbars off. 2. 36-14-00 Fig. 104 (Sheet 1) Block 1
R 21 21 06 __ R R	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) FLOW CONTROL switch in, OVHT on, flowbar off. ACM DISCH temp over 96 degrees C. 2. 21-21-00 Fig. 103 Block 5
21 21 07 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) FLOW CONTROL switch in, OVHT on, flowbar off. CPRSR DISCH temp over 220 degrees C. 2. 21-21-00 Fig. 103 Block 1
21 21 08 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) FLOW CONTROL switch out, flowbar on, normal pack flow. 2. 21-21-00 Fig. 105 Block 1
21 21 09 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) FLOW CONTROL switch out, flowbar on, no pack flow. 2. 21-21-00 Fig. 105 Block 1
21 21 10 00	1. Oil fumes or odors are present in cabin, airborne vibration monitor indicates normal engine vibration, APU low oil pressure fault flag is exposed. 2. 21-21-00 Fig. 106 Block 4
21 21 11 00	1. Oil fumes or odors are present in cabin, airborne vibration monitor indicates normal engine vibration, APU low oil pressure fault flag is not exposed. 2. 21-21-00 Fig. 106 Block 5

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 22 01 00	1. Flight Station air supply control knob position in, high air flow with excessive noise and drafty ventilation.
	2. 21-22-00 Fig. 103 Block 1
21 22 02 00	1. Flight Station air supply control knob position out, low air flow with excessive noise and restricted ventilation.
	2. 21-22-00 Fig. 103 Block 2
21 24 01 00	1. COOL AIR OVBD switchlight latched, CLOSE legend on.
	2. 21-24-00 Fig. 103 Block 4
21 24 02 00	1. COOL AIR OVBD switchlight unlatched, CLOSE legend off.
	2. 21-24-00 Fig. 103 Block 3
R 21 25 01 00 R	1. COOL AIR OVBD switchlight latched, CLOSE legend off. AVIONIC AIR, MID LO FLOW legend on.
	2. 21-25-00 Fig. 104 (Sheet 1) Block 1
21 25 02 00	1. NOT USED.
21 25 03 00	1. COOL AIR OVBD switchlight latched, CLOSE legend off. AVIONIC AIR MID OVBD legend on.
	2. 21-25-00 Fig. 104 (Sheet 1) Block 1
R 21 25 04 00 R	1. COOL AIR OVBD switchlight latched, CLOSE legend off. AVIONIC AIR FWD LO/FLO legend on.
	2. 21-25-00 Fig. 103 (Sheet 1) Block 1
21 25 05 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOCK REPORT 2. FAULT ISOLATION REFERENCE
21 25 06 00	1. COOL AIR OVBD switchlight latched, CLOSE legend off. AVIONIC AIR FWD OVBD legend on.
	2. 21-25-00 Fig. 103 (Sheet 1) Block 1
21 25 07 00	1. COOL AIR OVBD switchlight unlatched, CLOSE legend on. AVIONIC AIR FWD OVBD legend off, MID OVBD legend on.
	2. 21-25-00 Fig. 104 (Sheet 2) Block 1
21 25 08 00	1. COOL AIR OVBD switchlight unlatched, CLOSE legend on. AVIONIC AIR FWD OVBD legend on, MID OVBD legend off.
	2. 21-25-00 Fig. 103 (Sheet 2) Block 1
21 25 09 00	1. COOL AIR OVBD switchlight unlatched, CLOSE legend on. AVIONIC AIR FWD OVBD and MID OVBD legends on.
	2. 21-25-00 Fig. 103 (Sheet 2) Block 1 (FWD OVBD) 21-25-00 Fig. 104 (Sheet 2) Block 1 (MID OVBD)
21 25 10 00	1. NOT USED.
21 25 11 00	1. NOT USED.
21 25 12 00	1. INS COOLING switchlight unlatched, LO FLO legend off and ON legend on. Cycled INS COOLING switchlight (latched then unlatched), ON legend remained on.
	2. 21-25-00 Fig. 105 (Sheet 1) Block 1
21 25 13 00	1. INS COOLING switchlight unlatched, both legends on.
	2. 21-25-00 Fig. 105 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 25 14 00	1. INS COOLING switchlight latched, both legends off.
	2. 21-25-00 Fig. 105 Block 1
21 25 15 00	1. INS COOLING switchlight latched, both legends on.
	2. 21-25-00 Fig. 105 Block 1
21 25 16 00	1. PILOT INSTR COOL FAN ann. light on.
	2. 21-25-00 Fig. 106 Block 1
21 25 17 00	1. PILOT INSTR COOL SYS ann. light on.
	2. 21-25-00 Fig. 106 Block 1
R 21 25 18 00 R	1. INS COOLING switchlight unlatched, LO FLO legend on, ON legend off.
	2. 21-25-00 Fig. 105 (Sheet 1) Block 1
21 31 01 00	1. Cabin press FAULT Legend, cabin alt climbing with both outflow valves closed.
	2. 21-31-00 Fig. 105 Block 2
21 31 02 __	1. Cabin press FAULT Legend on cabin alt climbing, (01=Fwd, 02=Aft) outflow valve out of green, other in green.
	2. 21-31-00 Fig. 104 Block 3
21 31 03 00	1. Cabin press FAULT Legend on, acft alt less than 21K feet, cabin alt constant at 11.5K feet. Both outflow valves in green or closed.
	2. 21-31-00 Fig. 104 Block 3

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 31 04 00	1. Cabin press FAULT Legend on, acft alt less than 21K feet, cabin alt less than 11.5K feet. Both outflow valves closed.
	2. 21-31-00 Fig. 104 Block 2
21 31 05 __	1. Cabin press FAULT Legend on, acft alt over 15K feet but less than 21K feet, cabin alt less than 11.5K feet. (01=Fwd, 02=Aft) outflow valve out of green, other in green.
	2. 21-31-00 Fig. 104 Block 3
21 31 06 00	1. Cabin press FAULT Legend on, acft alt less than 15K feet, cabin alt at 11.5K feet. Both outflow valves in green or closed.
	2. 21-31-00 Fig. 104 Block 3
21 31 07 00	1. Cabin press FAULT Legend on, acft alt less than 15K feet, cabin alt less than 11.5K feet, both outflow valves closed.
	2. 21-31-00 Fig. 104 Block 2
21 31 08 00	1. NOT USED.
21 31 09 00	1. NOT USED.
21 31 10 00	1. Pressurization in STBY mode, cabin alt increasing with STBY RATE at HOLD, both outflow valves indicate closed or in green band.
	2. 21-31-00 Fig. 105 Block 6
21 31 11 __	1. Pressurization in STBY mode, cabin alt increasing with STBY RATE at HOLD, (01=Fwd, 02=Aft) outflow valve indicator not in green band, FAULT light off.
	2. 21-31-00 Fig. 105 Block 8

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 31 12 __	1. Pressurization in STBY mode, cabin alt increasing with STBY RATE at HOLD, (01=Fwd, 02=Aft) outflow valve indicator not in green band, FAULT light on. 2. 21-31-00 Fig. 104 Block 1
21 31 13 00	1. Pressurization in STBY mode, cabin alt decreasing with STBY RATE at HOLD. 2. 21-31-00 Fig. 105 Block 7
21 31 14 00	1. Pressurization in STBY mode, cabin alt constant, STBY RATE at DSCD. 2. 21-31-00 Fig. 105 Block 7
21 31 15 00	1. Pressurization in STBY mode, cabin alt constant, STBY RATE at ASCD. 2. 21-31-00 Fig. 105 Block 7
21 31 16 00	1. Pressurization in NORM mode, outflow valves did not close on takeoff. 2. 21-31-00 Fig. 107 Block 3
21 31 17 00	1. Pressurization in NORM mode, outflow valves did not open on touchdown. 2. 21-31-00 Fig. 107 Block 3
21 31 18 00	1. Pressurization in NORM mode, cabin alt higher than selected, both outflow valve indicators in green band, more than one pack on. 2. 21-31-00 Fig. 105 Block 7

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 31 19 __	1. Pressurization in NORM mode, cabin alt higher than selected, (01=FWD, 02=Aft, 03=Both) outflow valve indicator(s) not in green band, FAULT light on.
	2. 21-31-00 Fig. 105 Block 8
21 31 20 __	1. Pressurization in NORM mode, cabin alt higher than selected (01=Fwd, 02=Aft, 03=Both) outflow valve indicator(s) not in green band, FAULT light off.
	2. 21-31-00 Fig. 104 Block 1
21 31 21 00	1. Pressurization in NORM mode, cabin alt lower than that selected.
	2. 21-31-00 Fig. 105 Block 7
21 31 22 __	1. Pressurization in NORM mode, cabin alt fluctuating and (01=Fwd, 02=Aft, 03=Both) outflow valve indicator(s) fluctuating.
	2. 21-31-00 Fig. 105 Block 7
21 31 23 00	1. Pressurization in NORM mode, no response to NORM RATE change, STBY mode normal.
	2. 21-31-00 Fig. 105 Block 7
21 31 24 00	1. Pressurization in NORM mode, excessive cabin rate of climb, NORM RATE at pip.
	2. 21-31-00 Fig. 103 Block 1
21 31 25 __	1. (01=Fwd, 02=Aft) MANUAL cabin press switch out, MNL light and pilots ECS light on.
	2. 21-31-00 Fig. 106 Block 7

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 31 26 __	1. (01=Fwd, 02=Aft) MANUAL cabin press switch in, MNL light off, pilots ECS light on.
	2. 21-31-00 Fig. 105 Block 8
21 31 27 __	1. (01=Fwd, 02=Aft) MANUAL cabin press switch in, MNL light off, pilots ECS light off.
	2. 21-31-00 Fig. 106 Block 7
21 31 28 __	1. (01=Fwd, 02=Aft) MANUAL cabin press switch in, MNL light on, outflow valve did not respond to MANUAL OPEN toggle switch.
	2. 21-31-00 Fig. 106 Block 10
21 31 29 __	1. (01=Fwd, 02=Aft) MANUAL cabin press switch in, MNL light on, outflow valve did not respond to MANUAL CLOSE toggle switch.
	2. 21-31-00 Fig. 106 Block 10
21 31 30 00	1. Pressurization in NORM mode, cabin alt higher than selected, both outflow valves indicate closed, more than one pack on.
	2. 21-31-00 Fig. 105 Block 6
21 31 31 00	1. Pressurization in STBY mode, cabin alt increasing with STBY RATE at DSCD.
	2. 21-31-00 Fig. 105 Block 1
21 31 32 00	1. Pressurization in STBY mode, cabin alt decreasing with STBY RATE at ASCD.
	2. 21-31-00 Fig. 105 Block 1
R 21 31 33 00	1. Outflow valves oscillate from full open to full closed in NORM and STBY modes.
R	2. 21-31-00 Fig. 108 (Sheet 1) Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 32 01 __	1. (01=Fwd, 02=Aft) safety valve OPEN Legend on, cabin diff press normal.
	2. 21-32-00 SCHEM 1
21 32 02 __	1. (01=Fwd, 02=Aft) safety valve OPEN Legend on. Legend remained on after cabin diff press was again normal.
	2. 21-32-00 SCHEM 1
21 41 01 __	1. HOT AIR ISLN VALVE switclight latched (01=NO.2, 02=NO.3, 03=BOTH) OVHT legend on then went off, flowbars off.
	2. 21-41-00 Fig. 107 Block 1
21 41 02 __	1. HOT AIR ISLN switchlight latched, (01=NO.2, 02=NO.3, 03=BOTH) OVHT legend on steady, flowbars off.
	2. 21-41-00 Fig. 107 Block 1
21 41 03 00	1. NOT USED.
21 41 04 __	1. (01=No. 2, 02=No. 3) HOT AIR and ISLN VALVE flowbars on, switchlight latched. HOT MANF indicates high.
	2. 21-41-00 Fig. 110 Block 1
21 41 05 __	1. (01=No. 2, 02=No. 3) HOT AIR and ISLN VALVE flowbars on, switchlight latched. HOT MANF indicates low.
	2. 21-41-00 Fig. 110 Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 41 06 __	1. (01=No. 2, 02=No. 3) hot air ISLN VALVE flowbar off, switchlight latched, HOT MANF temperature 110 degrees C.
	2. 21-41-00 Fig. 108 Block 4
21 41 07 __	1. (01=No. 2, 02=No. 3) hot air ISLN VALVE flowbar off, switchlight latched, HOT MANF temp low.
	2. 21-41-00 Fig. 108 Block 7
21 41 08 __	1. (01=No. 2, 02=No. 3) hot air ISLN VALVE flowbar on, switchlight unlatched, HOT MANF temp 110 degrees C.
	2. 21-41-00 Fig. 109 Block 1
21 41 09 __	1. (01=No. 2, 02=No. 3) hot air ISLN VALVE flowbar on, switchlight unlatched, HOT MANF temp low.
	2. 21-41-00 Fig. 109 Block 3
21 41 10 __	1. (01=No. 2, 02=No. 3) HOT AIR flowbar off, switchlight latched, HOT MANF temp 110 degrees C.
	2. 21-41-00 Fig. 104 Block 4
21 41 11 __	1. (01=No. 2, 02=No. 3) HOT AIR flowbar off, switchlight latched, HOT MANF temp low.
	2. 21-41-00 Fig. 104 Block 5
21 41 12 __	1. (01=No. 2, 02=No. 3) HOT AIR switchlight latched, OFF legend on.
	2. 21-41-00 Fig. 106 Block 5

FAULT CODE INDEX
TABLE 1 (CONTINUED)

	FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
	21 41 13 __	1. (01=No. 2, 02=No. 3) HOT AIR switchlight unlatched, flowbar on. HOT MANF temp 110 degrees C.
		2. 21-41-00 Fig. 105 Block 2
	21 41 14 00	1. Hot air DUCT OVHT legend off, both HOT AIR and both ISLN VALVE flowbars off with switchlight latched, PACK FLOW CONTROL flowbar on.
R		2. 21-41-00 Fig. 104 Block 8
	21 41 15 __	1. (01=No. 2 Sys, 02=No. 3 Sys) hot air DUCT OVHT legend on then went off, both HOT AIR and both ISLN VALVE flowbars off with switchlight latched. HOT MANF temp above normal after switchlight cycled off and on.
R		2. 21-41-00 Fig. 103 Block 2
	21 41 16 __	1. (01=No. 2 Sys, 02=No. 3 Sys) hot air DUCT OVHT legend on then went off, both HOT AIR and both ISLN VALVE flowbars off with switchlight latched. HOT MANF temp normal after switchlight cycled off and on.
		2. 21-41-00 Fig. 103 Block 1
	21 41 17 00	1. Hot air DUCT OVHT legend on steady.
R		2. 21-41-00 Fig. 104 Block 6
	21 41 18 __	1. (01=No. 2, 02=No. 3) HOT AIR switchlight will not stay in.
R		2. 21-41-00 Fig. 106 Block 5
	21 41 19 __	1. (01=No. 2, 02=No. 3) HOT AIR switchlight unlatched, OFF legend off.
		2. 21-41-00 Fig. 106 Block 3

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 41 20 __	1. (01=No. 2, 02=No. 3) HOT AIR switchlight unlatched, flowbar on. HOT MANF temp low.
	2. 21-41-00 Fig. 105 Block 4
21 44 01 __	1. (01=Fwd, 02=Mid, 03=Aft) CARGO HEAT COLD legend on with switchlight latched.
	2. 21-44-00 Fig. 104 Block 1
21 44 02 00	1. NOT USED.
21 44 03 __	1. (01=Fwd, 02=Mid, 03=Aft) CARGO HEAT HOT legend remained on after switchlight unlatched. Pilots ECS annunciator legend on.
	2. 21-44-00 Fig. 103 Block 1
21 44 04 __	1. (01=Fwd, 02=Mid, 03=Aft) CARGO HEAT HOT legend and pilots ECS annunciator legend on. Both legends off after switchlight unlatched.
	2. 21-44-00 Fig. 103 Block 1
21 61 01 __	1. (01=Flt Sta, 02=Galley) switchlight latched, temp normal, selector set above or below normal.
	2. 21-61-00 Fig. 103 (Sheet 2) Block 1 (Flt Sta) 21-61-00 Fig. 103 (Sheet 1) Block 5 (Galley)
21 61 02 __	1. (01=Flt Sta, 02=Galley) switchlight latched, temp high or low, slow response to selector movement.
	2. 21-61-00 Fig. 103 (Sheet 2) Block 1 (Flt Sta) 21-61-00 Fig. 103 (Sheet 1) Block 5 (Galley)
21 61 03 __	1. (01=Flt Sta, 02=Galley) switchlight latched, temp high. Insufficient or no change when selector turned. Pack 1 ACM DISCH temp normal.
	2. 21-61-00 Fig. 103 (Sheet 2) Block 1 (Flt Sta) 21-61-00 Fig. 103 (Sheet 1) Block 5 (Galley)

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 61 04 __	1. (01=Flt Sta, 02=Galley) switchlight latched, temp low. Insufficient or no change when selector turned.
	2. 21-61-00 Fig. 103 (Sheet 2) Block 1 (Flt Sta) 21-61-00 Fig. 103 (Sheet 1) Block 6 (Galley)
21 61 05 00	1. FLT STA and GALLEY temp high. Pack 1 ACM DISCH high.
	2. 21-61-00 Fig. 103 (Sheet 1) Block 3
21 61 06 __	1. (01=Flt Sta, 02=Galley) switchlight latched, CLOSE legend on.
	2. 21-61-00 Fig. 105 Block 10
21 61 07 __	1. (01=Flt Sta, 02=Galley) zone trim switchlight unlatched, CLOSE legend off. Duct temperature normal.
	2. 21-61-00 Fig. 105 Block 3
21 61 08 __	1. (01=Flt Sta, 02=Galley) zone trim switchlight unlatched, CLOSE legend off. Duct temperature high.
	2. 21-61-00 Fig. 105 Block 4
21 61 09 00	1. NOT USED.
21 61 10 00	1. NOT USED.
21 61 11 00	1. NOT USED.
21 61 12 00	1. NOT USED.
21 61 13 00	1. NOT USED.
21 61 14 00	1. NOT USED.
21 61 15 00	1. NOT USED.
21 61 16 00	1. NOT USED.

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 61 17 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) Zone Trim switchlight latched, temp normal, no change when selector set above or below normal.
	2. 21-61-00 Fig. 104 (Sheet 1) Block 1
R 21 61 18 __ R R	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight latched, temp high or low, slow response to selector movement.
	2. 21-61-00 Fig. 104 (Sheet 1) Block 1
21 61 19 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight latched, temp high. Insufficient or no change when selector turned. Pack 2 and 3 ACM DISCH temp normal.
	2. 21-61-00 Fig. 104 (Sheet 1) Block 6
21 61 20 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight latched, temp high. Insufficient or no change when selector turned. Pack 2 and 3 ACM DISCH temp high.
	2. 21-61-00 Fig. 104 (Sheet 1) Block 11
21 61 21 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight latched, temp low. Insufficient or no change when selector turned.
	2. 21-61-00 Fig. 104 (Sheet 2) Block 1
R 21 61 22 __ R	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight latched, CLOSE legend on.
	2. 21-61-00 Fig. 105 Block 10
21 61 23 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight unlatched, CLOSE legend off, duct temp normal.
	2. 21-61-00 Fig. 105 Block 3

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 61 24 __	1. (01=Fwd Cab, 02=Mid Cab, 03=Aft Cab) switchlight unlatched, CLOSE legend off, duct temp high.
	2. 21-61-00 Fig. 105 Block 4
21 62 01 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) RAM AIR ind at (___o-clock) position while in AUTO mode. TURB BYP ind normal. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 02 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) RAM AIR ind stuck in cold position while in AUTO mode. TURB BYP ind normal. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 03 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) RAM AIR indication stuck in hot position while in AUTO mode. TURB BYP ind normal. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 04 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind at (___o-clock) position while in AUTO mode. RAM AIR ind normal. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 05 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind at (__o-clock) position while in AUTO mode. RAM AIR ind. abnormal. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 62 06 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind stuck in cold position while in AUTO mode. Corresponding pack flow control switchlight latched, flowbar legend on.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 07 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind stuck in hot position while in AUTO mode.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 08 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind at hot position while in AUTO mode and corresponding pack flow control flowbar legend off.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 1
21 62 09 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) MNL legend on, COOL pressed, TURB BYP erratic.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 1
21 62 10 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) in MNL mode RAM AIR erratic or does not reach full cool when COOL pressed.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 2
21 62 11 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) in MNL mode, TURB BYP or RAM AIR do not move when COOL pressed.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 10
21 62 12 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) in MNL mode. TURB BYP erratic or does not reach full warm when WARM pressed.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 2

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 62 13 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) in MNL mode. RAM AIR erratic or moves before TURB BYP full warm when WARM pressed.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 2
21 62 14 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) in MNL mode, TURB BYP or RAM AIR do not move when WARM pressed.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 10
21 62 15 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) TURB BYP ind at hot position while in MNL mode.
	2. 21-62-00 Fig. 103 (Sheet 1) Block 8
21 62 16 00	1. Humidity switchlight latched, ACM DISCH temp normal, fog at many outlets.
	2. 21-62-00 Fig. 104 Block 4
21 62 17 00	1. Humidity switchlight latched, ACM DISCH temp normal, dripping water.
	2. 21-62-00 Fig. 104 Block 11
21 62 18 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) ACM DISCH temp high. Humidity switchlight latched.
	2. 21-62-00 Fig. 104 Block 3
21 62 19 00	1. Humidity switchlight latched, packs 1 and 2 ACM DISCH temp high.
	2. 21-62-00 Fig. 104 Block 3
21 62 20 00	1. Humidity switchlight latched, ON legend off, all 3 pack ACM DISCH temp high.
	2. 21-62-00 Fig. 104 Block 6

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 62 21 00	1. Humidity switchlight latched, ON legend off, pack 3 ACM DISCH temp high.
	2. 21-62-00 Fig. 104 Block 6
21 62 22 00	1. Humidity switchlight latched, ON legend off, all 3 pack ACM DISCH temp normal.
	2. 21-62-00 Fig. 104 Block 6
21 62 23 00	1. Humidity switchlight unlatched, ON legend on, all 3 packs ACM DISCH temp normal.
	2. 21-62-00 Fig. 104 Block 1
R 21 62 24 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) Both Valves not operating OK with Auto/Manual Switch unlatched.
	2. 21-62-00 Fig. 103 (Sheet 2) Block 6
R 21 62 25 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) Chugging noise heard with RAM AIR ind in hot position. TURB BYP ind normal. Corresponding pack flow control switchlight latched, flowbar legend on.
R	2. 21-62-00 Fig. 105 Block 1
21 63 01 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) FLOW CONTROL switch in, flowbar on, erratic surging pack air flow.
	2. 21-63-00 Fig. 105 Block 3
21 63 02 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) air flow high.
	2. 21-63-00 Fig. 105 Block 9
21 63 03 00	1. CABIN temp ind faulty on all measurements. ECS also faulty.
	2. 21-63-00 Fig. 103 Block 10

FAULT CODE INDEX
TABLE 1 (CONTINUED)

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 63 04 00	1. CABIN temp ind faulty on all measurements. ECS OK.
	2. 21-63-00 Fig. 103 Block 11
21 63 05 __	1. (01=Flt Sta, 02=Fwd Cab, 03=Mid Cab, 04=Aft Cab, 05=Galley) ZONE temp ind fault.
	2. 21-63-00 Fig. 103 Block 8
21 63 06 __	1. (01=Flt Sta, 02=Fwd Cab, 03=Mid Cab, 04=Aft Cab, 05=Galley) DUCT temp ind fault.
	2. 21-63-00 Fig. 103 Block 12
21 63 07 00	1. ECS temp ind faulty on all measurements. CABIN TEMP also faulty.
	2. 21-63-00 Fig. 104 Block 6
21 63 08 00	1. ECS temp ind faulty on all measurements. CABIN TEMP OK.
	2. 21-63-00 Fig. 104 Block 7
21 63 09 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) PACK INLET, CPRSR DISCH, TURB INLET, ACM DISCH or HOT MANF temp ind fault.
	2. 21-63-00 Fig. 104 Block 5
21 63 10 00	1. NOT USED.
21 63 11 00	1. NOT USED.
21 63 12 00	1. NOT USED.
21 63 13 00	1. NOT USED.
R 21 63 14 00 R	1. Pack Flow indicator faulty on all measurements. Cabin pressure normal.
	2. 21-63-00 Fig. 105 Block 8

FAULT CODE INDEX
TABLE 1

FAULT CODE	1. LOG BOOK REPORT 2. FAULT ISOLATION REFERENCE
21 63 15 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) flow indicator faulty on measurement. Cabin pressure normal.
	2. 21-63-00 Fig. 105 Block 12
21 63 16 __	1. (01=Pack 1, 02=Pack 2, 03=Pack 3) flow control switchlight latched flowbar legend on, no or low pack air flow, cabin pressure abnormal.
	2. 21-63-00 Fig. 105 Block 6

AIR CONDITIONING - DESCRIPTION AND OPERATION

1. General

R The air conditioning system provides complete environmental control (pressurization, ventilation and temperature) for the flight station, cabin, lavatories, galley, cargo compartments, forward electronic service center (FESC) and mid electrical service center (MESC) (Ref. Fig. 1, 2 and 3).

All controls and indicators for the air conditioning system are on the Flight Engineer/Second Officers upper panel, zone 215, except for an ECS caution light on the main instrument panel, zone 210. Panel areas are identified as ENGINE BLEED CONTROL, CABIN TEMP CONTROL, CABIN PRESSURE CONTROL, ECS MONITOR, APU CONTROL, and HUMIDITY CONTROL (Ref. Fig. 4). Cabin pressure indicators, two safety valve OPEN lights, and the cabin altitude warning horn cutout switch are also located on a panel in this grouping. The ENGINE BLEED CONTROL and the CABIN TEMP CONTROL areas are on one panel section. This panel includes controls and indicators for the air conditioning system (lower half) and for the pneumatic system (upper half) (Ref. 36-00-00). The combined grouping of panels is identified as the integrated pneumatic system control panels.

Between the forward and aft pressure bulkheads the only areas not pressurized are:

The nosewheel well and the areas on each side of it, zones 114 through 118

The wing center section and the area below it, zones 141 through 144 (the top of the wing center section, zone 145, and the forward main beam carry cabin pressure)

The main wheel wells and the area between them, including the hydraulic center, zones 147, 148, and 149

This chapter divides the air conditioning system into six subsystems: compression, distribution, pressurization control, heating, cooling, and temperature control.

A. Compression (Ref. 21-10-00)

Compressed air for the air conditioning system is taken from the pneumatic system distribution manifold crossbleed duct (Ref. 36-14-00) located under the forward portion of the wing center section (Ref. Fig. 5). Air in the pneumatic system is furnished by:

(1) The engine bleed air system (Ref. 36-11-00). Each engine normally supplies 122 pounds per minute (ppm) air flow at cruise power, 180 ppm at takeoff, or 150 ppm at ground idle. With three engines operating, the air conditioning system operates at optimum capacity; each engine supplies one air cycle pack system. If one engine bleed air source becomes unavailable, there would be minimal effect on comfort or safety. Cabin pressurization and adequate temperature control can be maintained with only one engine bleed air source.

(2) The APU-driven load compressor (Ref. 36-12-00 and 49-00-00). The load compressor supplies up to 420 ppm and can operate the entire air conditioning system at optimum capacity. The APU is intended primarily for on-ground use but can be used in flight to limited altitudes.

(3) High-pressure ground air sources (Ref. 36-13-00). Three standard connections on the manifold crossbleed duct allow use of up to three high-pressure ground air source hoses. Units delivering a total flow up to 450 ppm of air may be used for full system operation. Partial system operation is available using lower output sources.

(4) Preconditioned ground air sources (Ref. 21-21-00). Two standard connections into the distribution system allow the use of preconditioned ground air sources for air conditioning the cabin without operating the aircraft system.

B. Distribution (Ref. 21-20-00)

The distribution system includes: All components and ducting used to deliver fresh air from the pneumatic system to the flight station, cabin, and galley (except cooling and temperature control system components);The galley positive
R ventilation/exhaust system; and the positive ventilation/exhaust systems for the forward electronic and mid electrical service centers.

Air conditioning system supply air (Ref. 21-21-00) is taken from the pneumatic system through three air cycle pack flow control valves. Ducts along the bottom of the fuselage carry the flow- and pressure-regulated air forward to the air cycle packs. The No. 1 air cycle pack is on the left side of the nosewheel well, and the No. 2 and No. 3 packs are on the right side of the nosewheel well.

Temperature-controlled discharge air from all three packs (Ref. 21-62-00) enters a common cold air plenum for

distribution to the occupied areas of the cabin. Air leaving the plenum is further temperature-controlled according to individual area requirements by the zone trim system (Ref. 21-61-00) by adding hot air from the hot air manifold system (Ref. 21-41-00). This mixed air is delivered through individual ducting systems to the flight station (Ref. 21-22-00), three cabin zones (Ref. 21-23-00) and the galley (Ref. 21-24-00).

Low-pressure preconditioned ground air sources, delivering up to 2500 cubic feet of air per minute, may be connected to each of two connections to deliver air directly to the low-pressure air distribution system.

Flight station air is exhausted through floor-level outlets to the forward electronic service center. Cabin air, exhausted through floor-level outlets, passes beneath the floor to enter the forward electronic service center, the mid electrical service center and the cheek areas outboard of the underfloor compartments. The galley exhaust system (Ref. 21-24-00) receives air from around the galley ovens and exhausts the air overboard. The refrigerator exhaust air is ducted to the underfloor area to be exhausted through the forward outflow valve.

The positive ventilation/exhaust system for the galley maintains a flow-controlled overboard exhaust both in flight and on the ground. If cabin pressure has to be conserved, the overboard exhaust valve may be closed to shut off galley exhaust airflow.

The positive ventilation/exhaust systems for the forward electronic and mid electrical service centers (Ref. 21-25-00) exhaust cooling air from these compartments directly overboard when on the ground. When airborne, the FESC air is exhausted below the forward cargo compartment. The MESC air is exhausted to below the galley floor. Both the FESC and the MESC exhaust air are then dumped overboard through the forward outflow valve.

The lavatory systems (Ref. 21-26-00) include both fresh air supply and positive ventilation/exhaust systems. Individual air outlets in each lavatory take air from the forward and aft cabin systems. Exhaust air flow is routed through the waste tanks and directly overboard through flow-controlling valves. In flight, cabin pressure normally assures exhaust flow. When the cabin is not pressurized in flight or on the ground, exhaust flow is maintained by jet pumps in the exhaust systems.

C. Pressurization Control (Ref. 21-30-00)

The cabin pressure control system (Ref. 21-31-00) includes the cabin pressure control panel, the cabin pressure controller, and two electrically operated outflow valves. Normal control is automatic with cabin altitude selections from -1,000 feet to 10,000 feet (automatic rate of change control). Standby mode controls are available in the event of a malfunction. Normal and standby modes use ac valve actuators. Manual control of outflow valves is always available using separate dc valve actuators.

The safety relief system (Ref. 21-32-00) includes two positive-pressure cabin safety relief valves and two negative-pressure relief valves. The two positive-pressure safety relief valves are independent, pneumatically operated units. The valves protect the fuselage structure from overpressurization in event of pressure control system misuse or malfunction. The negative-pressure relief valves prevent cabin pressure from being less than atmospheric pressure.

The cabin pressurization control indication system (Ref. 21-33-00) includes indicators showing cabin altitude, cabin differential pressure, and cabin pressure rate-of-change.

The cabin pressure warning system (cabin altitude above 10,000 feet) is part of the aural warning system (Ref. 31-22-00).

D. Heating (Ref. 21-40-00)

The heating system includes the hot air manifold, floor heat, and cargo heat systems.

The hot air manifold system (Ref. 21-41-00) takes uncooled and partially cooled air from the No. 2 and No. 3 air cycle cooling packs to obtain a mixed air temperature of 230 degrees F. Hot air from the manifold system is used by the zone trim system (Ref. 21-61-00).

The floor heat system (Ref. 21-43-00) includes heated floor panels in the cabin and footwarmer pneumatic ducts in the flight station.

Mid cabin floor panels (over the wing, the main wheel wells, and the hydraulic service center) are electrically heated to maintain comfortable floor temperatures.

Pneumatic ducts blow hot air over the Captains and First Officers feet.

The cargo heat systems (Ref. 21-44-00) maintain cargo compartment temperatures above freezing. A fan, a heat exchanger, and a ducting system for eachcargo compartment recirculates compartment air while maintaining compartment temperature between 55 and 70 degrees F (13-21°C). The heat exchanger for the forward cargo compartment takes heat from the three air cycle pack supply ducts below that compartment. The heat exchangers for the mid and aft cargo compartments take heat from the pneumatic system duct in the left cheek area outboard of these compartments; this duct carries No. 2 engine bleed air or APU load compressor air.

E. Cooling (Ref. 21-51-00)

Cooling of the air taken from the pneumatic system is provided by three independent air cycle cooling systems, or packs (Ref. 21-51-00), using identical components. The No. 1 pack is located in the unpressurized areas on the left side of the nosewheel well in zones 115 and 117, and the No. 2 and No. 3 systems are located on the right side in zones 116 and 118.

Each air cycle pack includes a dual heat exchanger, a three wheel bootstrap air cycle machine, two check valves, and a water separator. A turbine bypass valve and ram cooling airflow components in the air cycle pack are functionally part of the temperature control system. Operation of each air cycle pack is controlled by individual pack temperature controllers and sensors (Ref. 21-62-00). Manual control of individual packs is also provided.

F. Temperature Control (Ref. 21-60-00)

The temperature control system includes the zone trim control system, the air cycle pack control system, the temperature indicating and monitoring system, and the built-in system test.

The zone trim control system (Ref. 21-61-00) controls individual supply air temperatures to each of five temperature control zones. These zones are the flight station; the forward, mid, and aft cabin areas; and the galley.

Each of the five independent systems includes a temperature selector, a zone temperature controller, a zone temperature sensor, a supply duct temperature sensor, and a zone trim control valve.

The five zone temperature controllers relay zone supply air temperature requirements to the air cycle pack control system (Ref. 21-62-00). The pack temperature controllers

are controlled by the zone temperature controllers to produce pack discharge temperatures for the coolest zone requirements. During full system operation, the flight station and galley zone controllers are connected to the No. 1 pack controller and the three cabin zone controllers are connected to all three pack controllers. When No. 1 pack is not in use, the flight station and galley controllers are connected to the No. 2 pack controller. No circuit changes are made when No. 2 or No. 3 pack is not in use.

The zone trim system then adds hot air from the hot air manifold, as needed, to warm the air going to zones other than the coolest.

The indicating and monitoring system (Ref. 21-63-00) includes sensors, selectors, and indicators to allow airflow through each pack, and temperatures at significant points in the packs, supply ducts, and occupied areas to be monitored (Ref. Fig. 4).

The built-in system test (Ref. 21-64-00) is a temperature control system test module connected to zone and pack temperature control circuits. The system allows on-ground check of the complete temperature control system from a single point. The system isolates open or short circuit conditions, unit failures, and provides go, no-go information only.

G. Humidity Control

The humidity control system provides removal of the maximum amount of moisture from pack discharge air by producing minimum discharge temperatures (38 degrees F, 2 degrees C) from all three packs. The zone trim system then adds hot air from the hot air manifold to achieve required zone temperatures in all five zones.

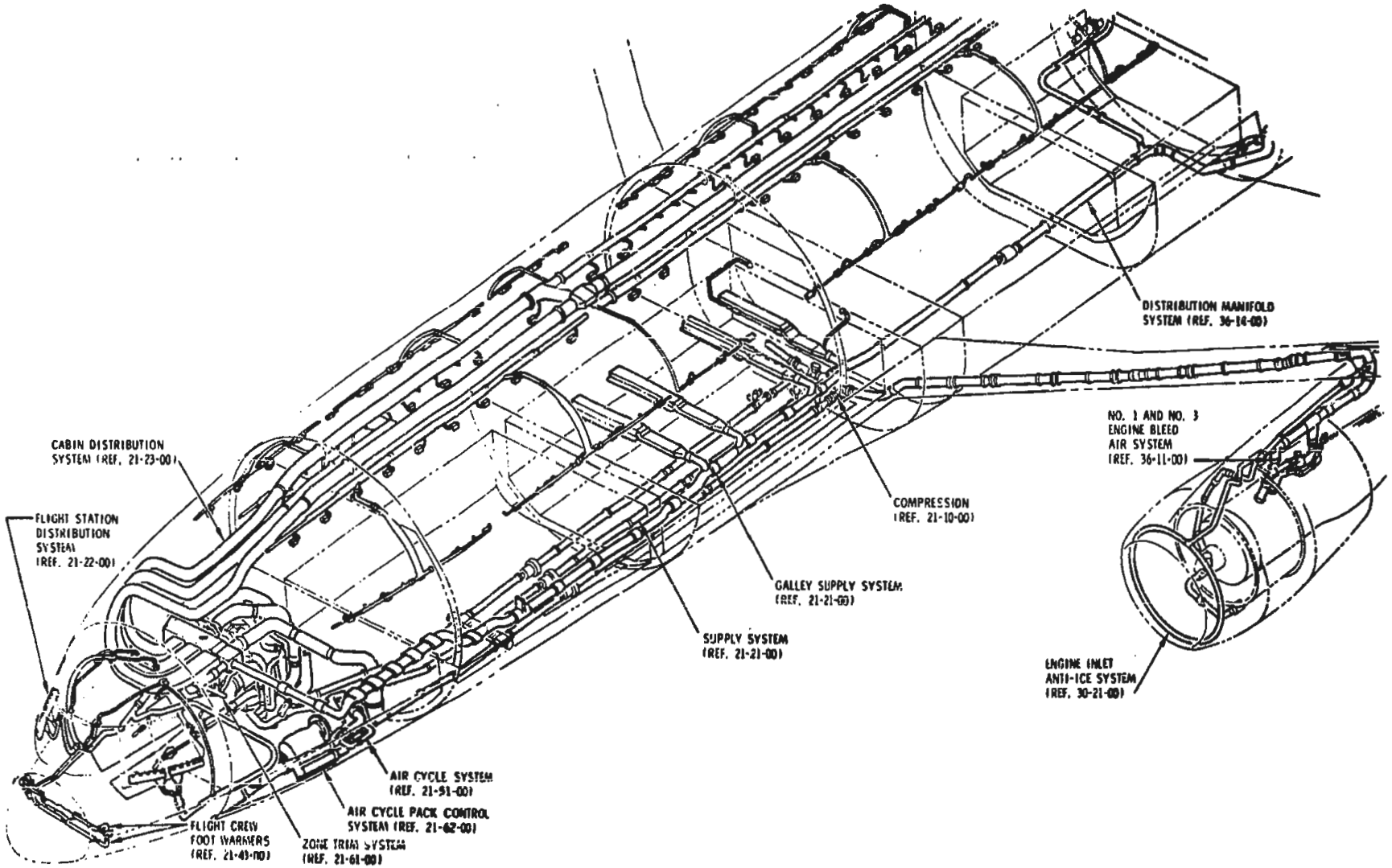
When the humidity control system is selected for use (Ref. Fig. 4) the zone controllers are disconnected from the pack controllers and a simulated demand for minimum temperature supplied to all three pack controllers.

H. Aircraft Integrated Data System (AIDS)

The AIDS (Ref. 31-32-00) monitors the air conditioning system as follows:

FUNCTION	ATA NO.
Bearing temperature of the galley exhaust fan	21-24-00

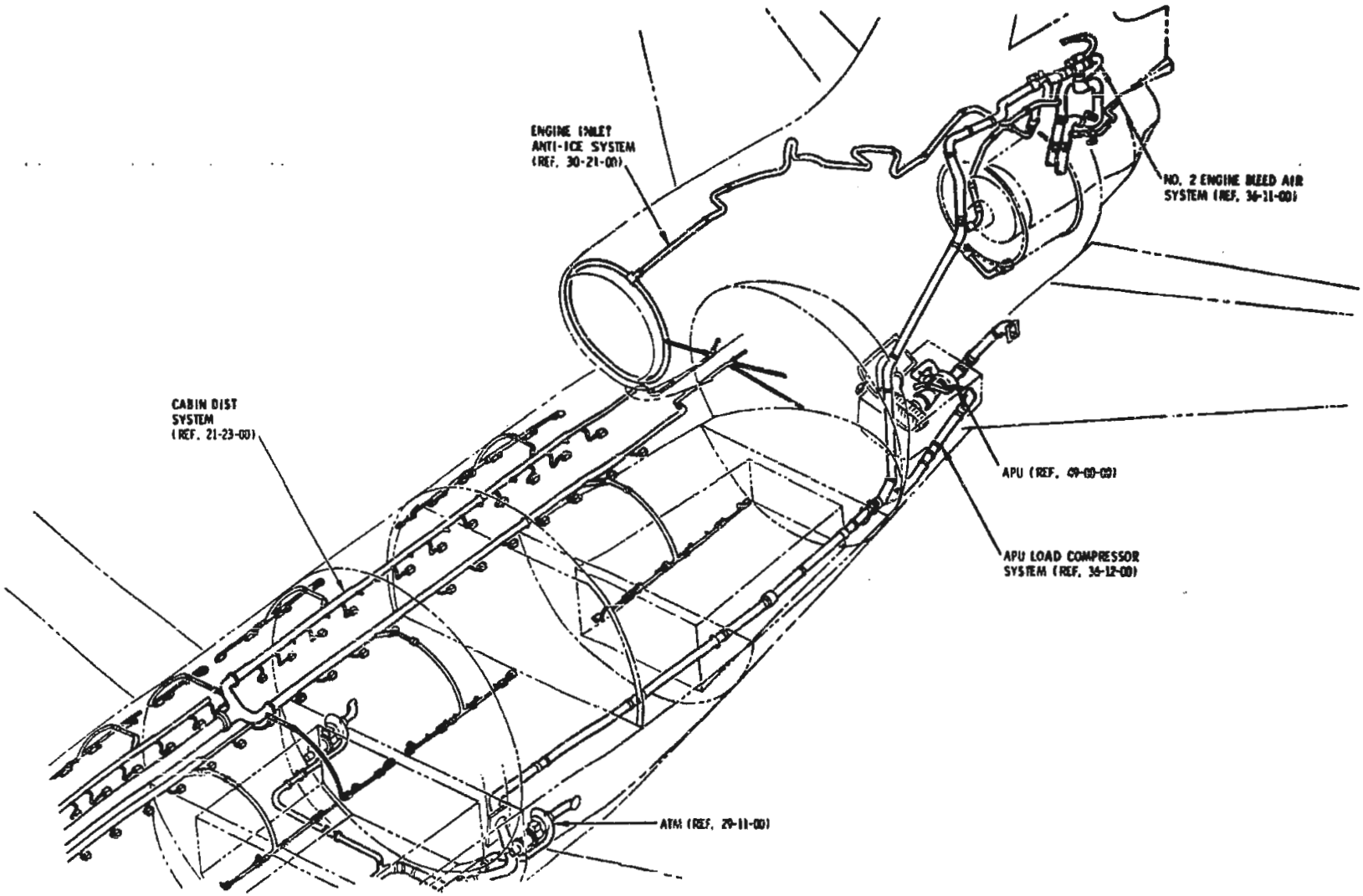
FUNCTION	ATA NO.
Bearing temperature of the forward electronic and mid electrical service center fans	21-25-00
Position of the forward and aft safety valves	21-32-00
Positions of the No. 2 and No. 3 hot air manifold temperature control valves	21-41-00
Positions of the No. 2 and No. 3 hot air manifold isolation valves	21-41-00
Bearing temperature of the forward, mid, and aft cargo compartment fans	21-44-00
Air temperature of the forward, mid, and aft cargo compartments	21-44-00
Bearing temperature of the No. 1, No. 2, and No. 3 air cycle machines	21-51-00
Water separator pressure in the No. 1, No. 2. and No. 3 air cycle packs	21-51-00
Pressure in the cold air plenum	21-51-00
Positions of the No. 1 through No. 5 zone trim valves	21-61-00
Airflow from air cycle packs No. 1, No. 2, and No. 3	21-63-00
Discharge air temperature of air cycle packs No. 1, No. 2, and No. 3	21-63-00
Turbine inlet air temperature of ACM No. 1, No. 2, and No. 3	21-63-00
Air temperature of zone No. 5	21-63-00
Air temperature in the No. 1 through No. 5 zone ducts	21-63-00


DISTRIBUTION MANIFOLD SYSTEM (REF. 36-14-00)
NO. 1 AND NO. 3 ENGINE BLEED AIR SYSTEM (REF. 36-11-00)
CABIN DISTRIBUTION SYSTEM (REF. 21-23-00)
FLIGHT STATION DISTRIBUTION SYSTEM (REF. 21-22-00)
COMPRESSION (REF. 21-10-00)
GALLEY SUPPLY SYSTEM (REF. 21-21-00)
SUPPLY SYSTEM (REF. 21-21-00)
ENGINE INLET ANTI-ICE SYSTEM (REF. 30-21-00)
AIR CYCLE SYSTEM (REF. 21-51-00)
AIR CYCLE PACK CONTROL SYSTEM (REF. 21-62-00)
FLIGHT CREW FOOT WARMERS (REF. 21-43-00)
ZONE TRIM SYSTEM (REF. 21-61-00)

C 002
M1-5100-21-157

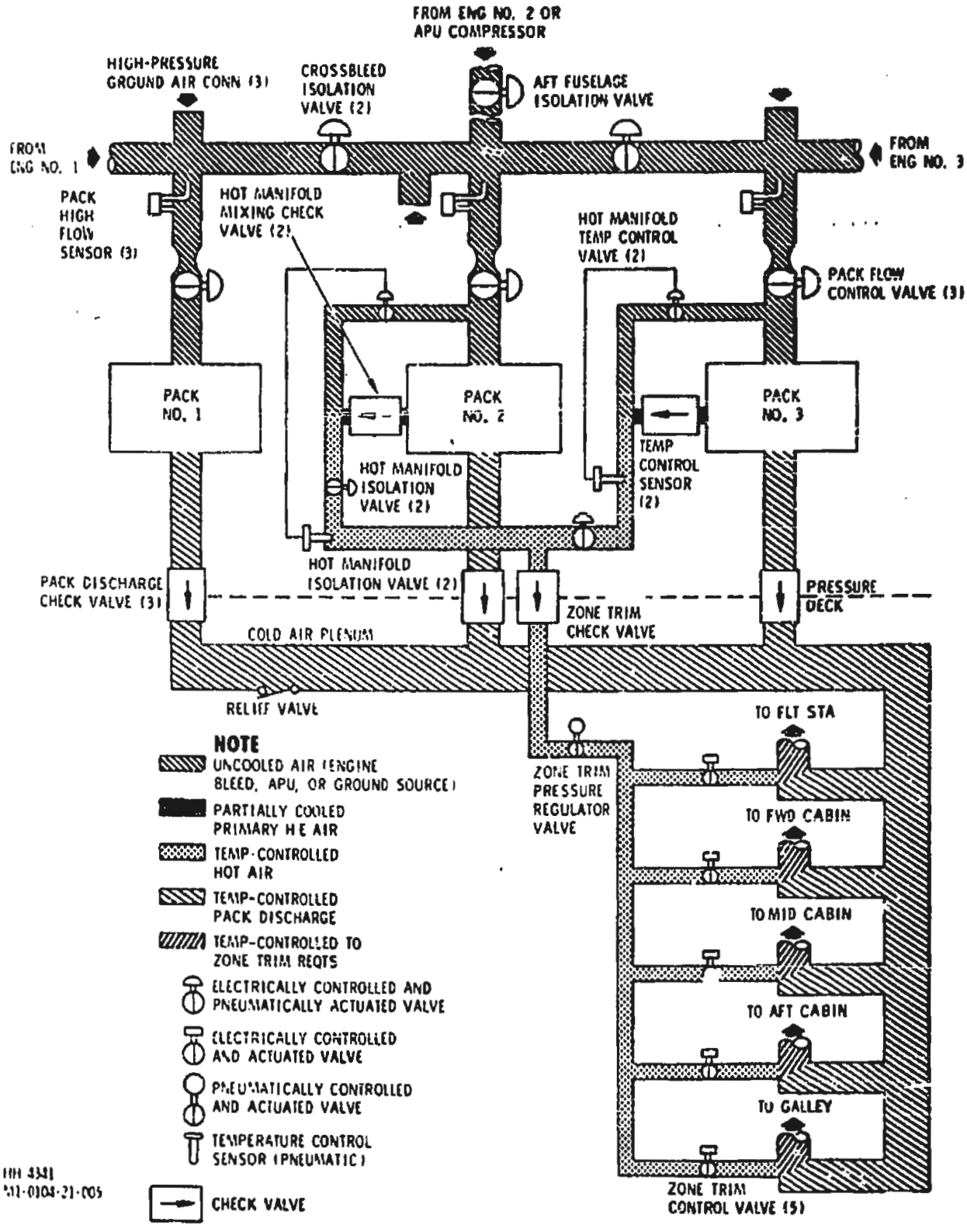
Air Conditioning Supply System
Figure 1 (Sheet 1)

R EFFECTIVITY: ALL
R
0018

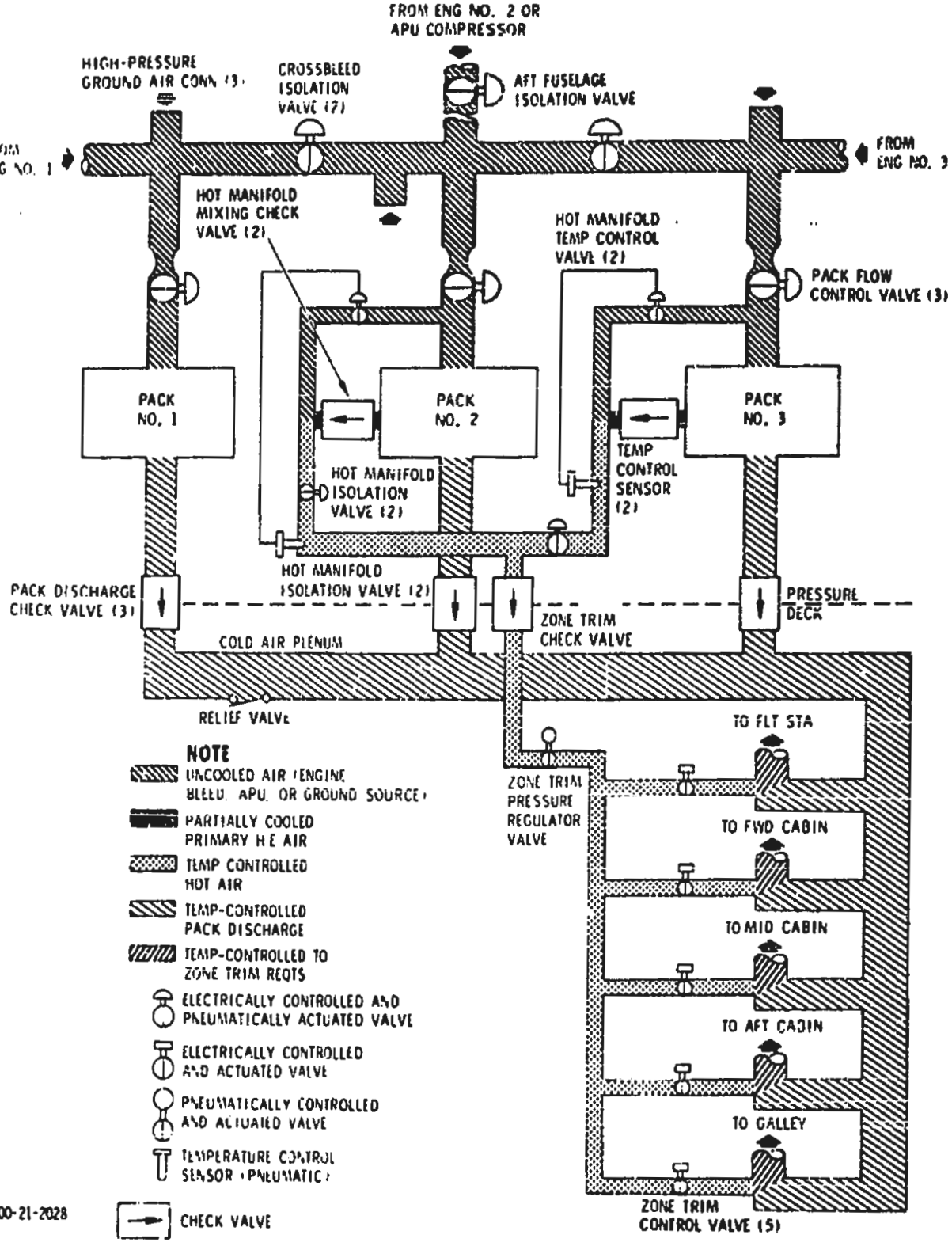


Air Conditioning Supply System
Figure 1 (Sheet 2)

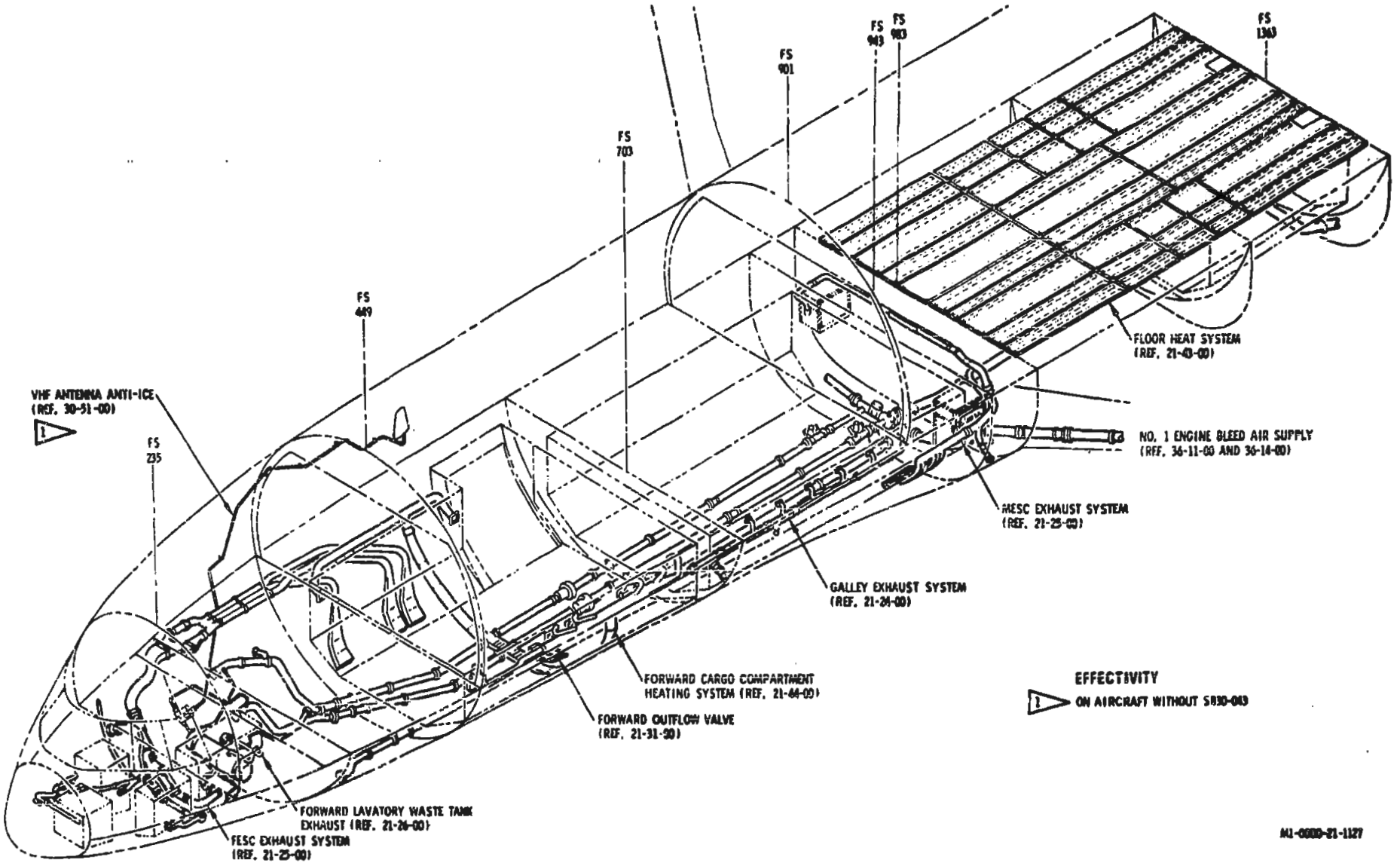
R EFFECTIVITY: ALL
R
0018


FROM ENG NO. 2 OR APU COMPRESSOR
HIGH-PRESSURE GROUND AIR CONN (1)
CROSSBLEED ISOLATION VALVE (2)
AFT FUSELAGE ISOLATION VALVE
FROM ENG NO. 1
FROM ENG NO. 3
PACK HIGH FLOW SENSOR (3)
HOT MANIFOLD MIXING CHECK VALVE (2)
HOT MANIFOLD TEMP CONTROL VALVE (2)
PACK FLOW CONTROL VALVE (3)
PACK NO. 1
PACK NO. 2
PACK NO. 3
TEMP CONTROL SENSOR (2)
HOT MANIFOLD ISOLATION VALVE (2)
HOT MANIFOLD ISOLATION VALVE (2)
PACK DISCHARGE CHECK VALVE (3)
PRESSURE DECK
ZONE TRIM CHECK VALVE
COLD AIR PLENUM
RELIEF VALVE
TO FLT STA
ZONE TRIM PRESSURE REGULATOR VALVE
TO FWD CABIN
TO MID CABIN
TO AFT CABIN
TO GALLEY
ZONE TRIM CONTROL VALVE (5)
NOTE
UNCOOLED AIR (ENGINE BLEED, APU, OR GROUND SOURCE)
PARTIALLY COOLED PRIMARY HE AIR
TEMP-CONTROLLED HOT AIR
TEMP-CONTROLLED PACK DISCHARGE
TEMP-CONTROLLED TO ZONE TRIM REQTS
ELECTRICALLY CONTROLLED AND PNEUMATICALLY ACTUATED VALVE
ELECTRICALLY CONTROLLED AND ACTUATED VALVE
PNEUMATICALLY CONTROLLED AND ACTUATED VALVE
TEMPERATURE CONTROL SENSOR (PNEUMATIC)
CHECK VALVE

Air Conditioning Supply System Simplified Schematic
Figure 2

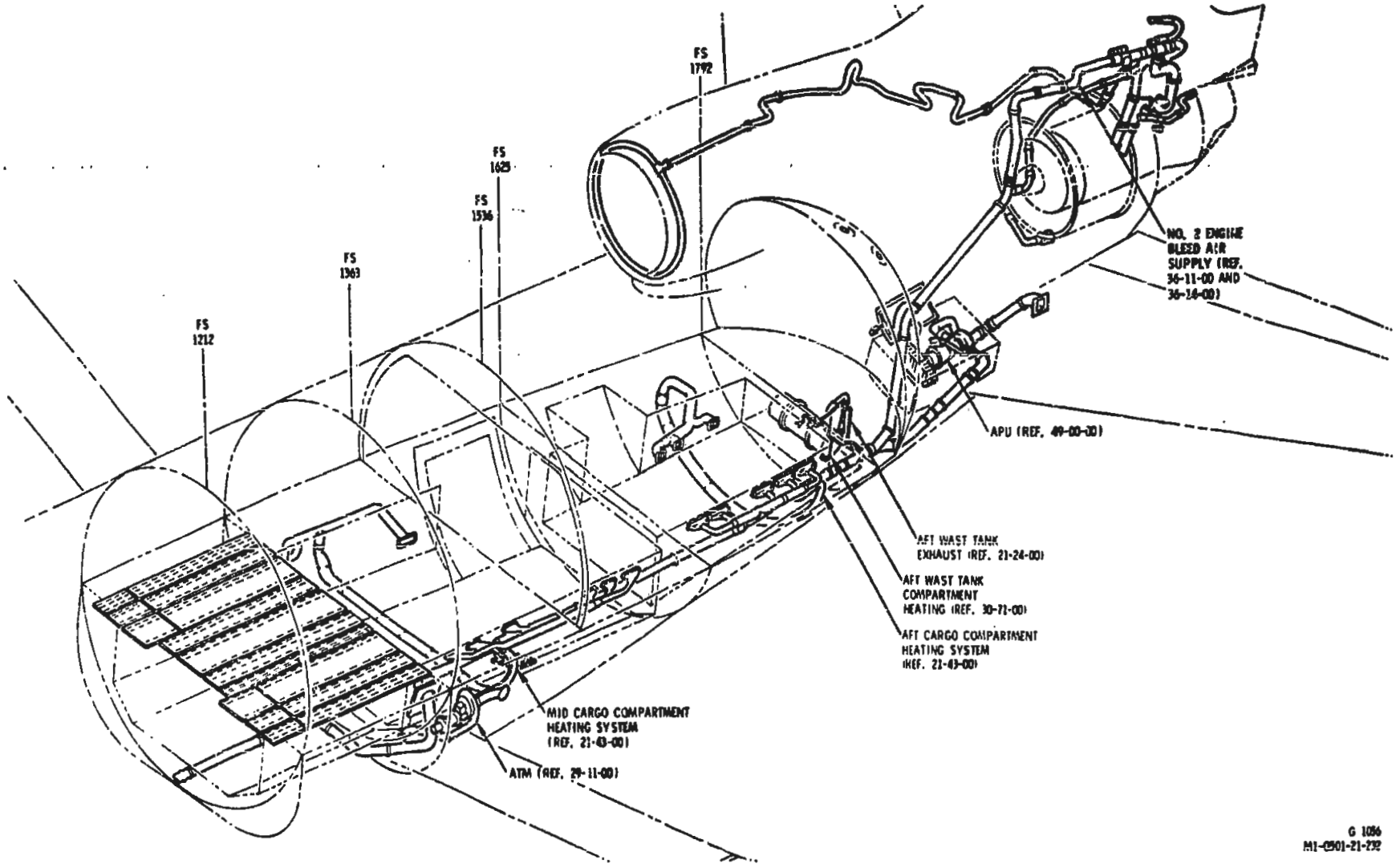

FROM ENG NO. 2 OR APU COMPRESSOR
HIGH-PRESSURE GROUND AIR CONN (3)
CROSSBLEED ISOLATION VALVE (2)
AFT FUSELAGE ISOLATION VALVE
FROM ENG NO. 1
FROM ENG NO. 3
HOT MANIFOLD MIXING CHECK VALVE (2)
HOT MANIFOLD TEMP CONTROL VALVE (2)
PACK FLOW CONTROL VALVE (3)
PACK NO. 1
PACK NO. 2
PACK NO. 3
HOT MANIFOLD ISOLATION VALVE (2)
TEMP CONTROL SENSOR (2)
HOT MANIFOLD ISOLATION VALVE (2)
PACK DISCHARGE CHECK VALVE (3)
PRESSURE DECK
ZONE TRIM CHECK VALVE
COLD AIR PLENUM
RELIEF VALVE
TO FLT STA
TO FWD CABIN
TO MID CABIN
TO AFT CABIN
TO GALLEY
ZONE TRIM PRESSURE REGULATOR VALVE
ZONE TRIM CONTROL VALVE (5)
NOTE
UNCOOLED AIR (ENGINE BLEED, APU, OR GROUND SOURCE)
PARTIALLY COOLED PRIMARY H E AIR
TEMP CONTROLLED HOT AIR
TEMP-CONTROLLED PACK DISCHARGE
TEMP-CONTROLLED TO ZONE TRIM REQTS
ELECTRICALLY CONTROLLED AND PNEUMATICALLY ACTUATED VALVE
ELECTRICALLY CONTROLLED AND ACTUATED VALVE
PNEUMATICALLY CONTROLLED AND ACTUATED VALVE
TEMPERATURE CONTROL SENSOR (PNEUMATIC)
CHECK VALVE
M1-0000-21-2028

R R Air Conditioning Supply System Simplified Schematic
Figure 2

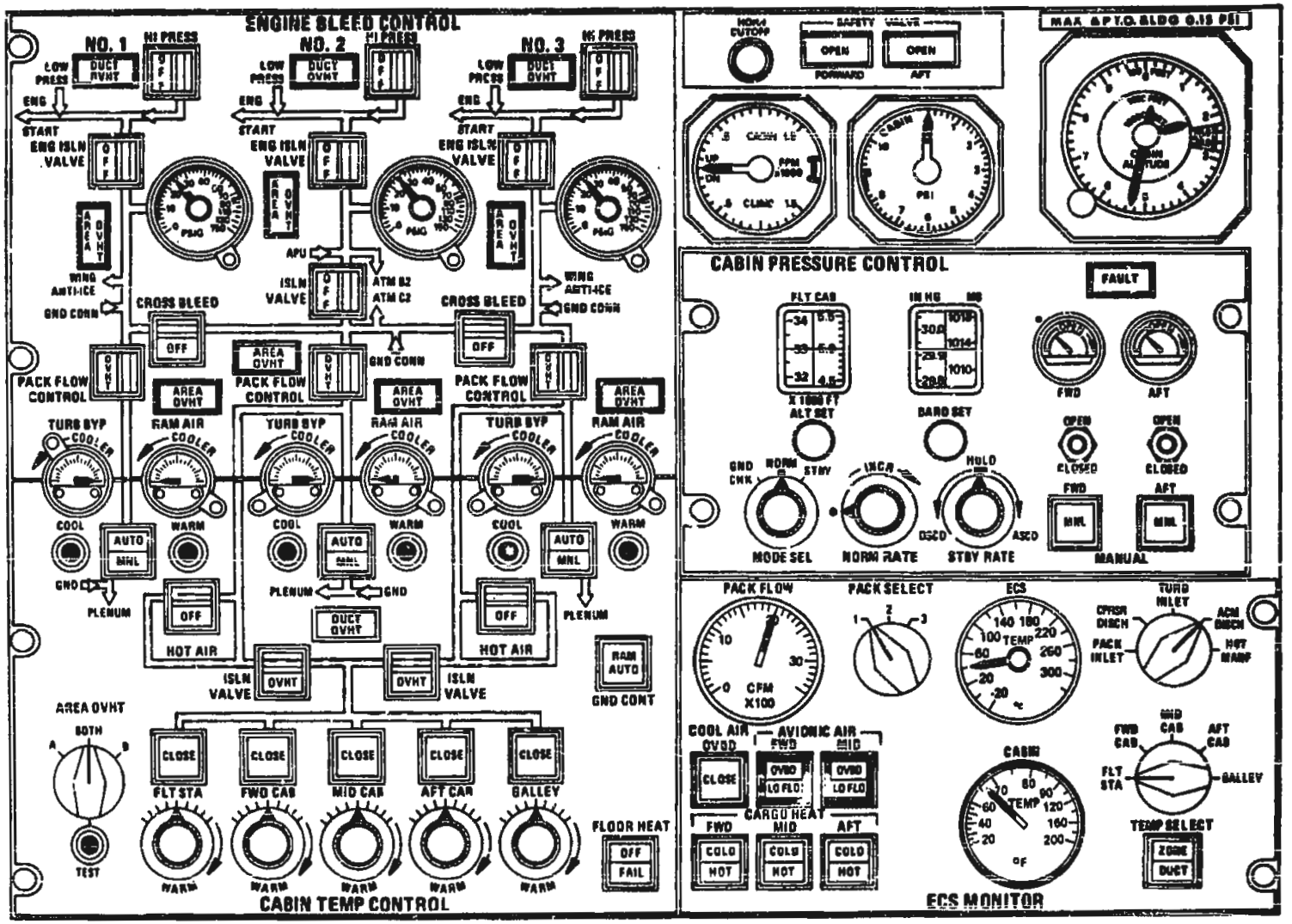


R Air Conditioning Exhaust and Heating System
R Figure 3 (Sheet 1)

R EFFECTIVITY: ALL
R
001B


FS 1792
FS 1625
FS 1536
FS 1363
FS 1212
NO. 2 ENGINE BLEED AIR SUPPLY (REF. 36-11-00 AND 36-14-00)
APU (REF. 49-00-00)
AFT WAST TANK EXHAUST (REF. 21-24-00)
AFT WAST TANK COMPARTMENT HEATING (REF. 30-71-00)
AFT CARGO COMPARTMENT HEATING SYSTEM (REF. 21-43-00)
MID CARGO COMPARTMENT HEATING SYSTEM (REF. 21-43-00)
ATM (REF. 29-11-00)
G 1086
M1-0901-21-732

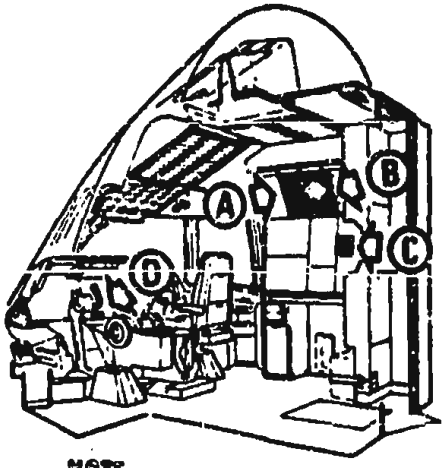
Air Conditioning Exhaust and Heating System
Figure 3 (Sheet 2)



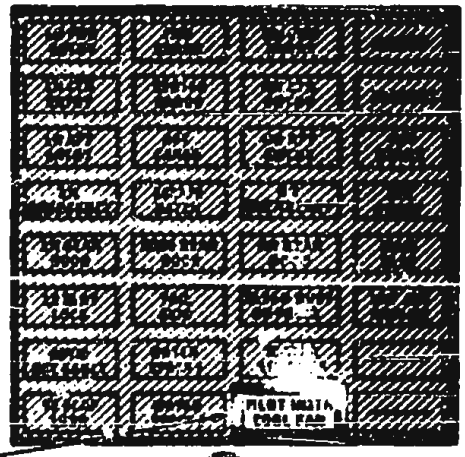
MI-5008-21-152

Integrated Pneumatic System Control Panels
Figure 4 (Sheet 1)

R
R
0018 EFFECTIVITY: ALL

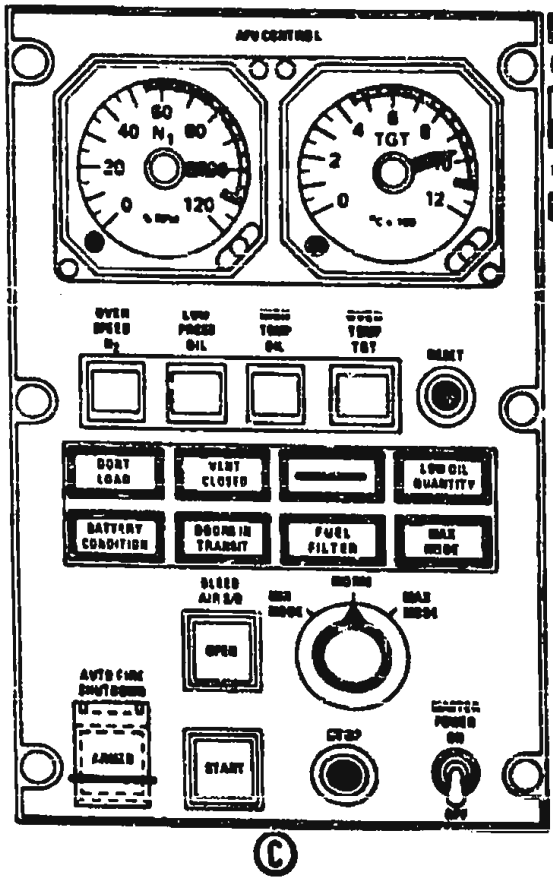


NOTE
SEE SHEET 1 FOR (A)



1 EFFECTIVITY
ON AIRCRAFT WITH SB 21-125

(B)



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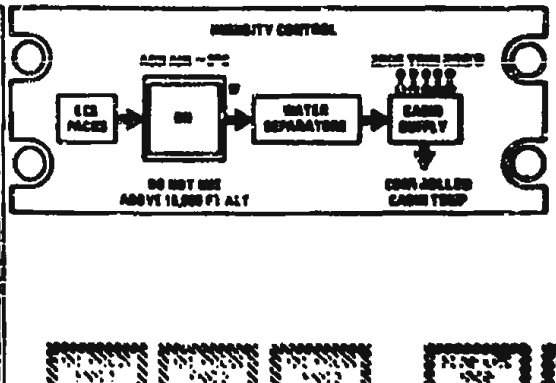
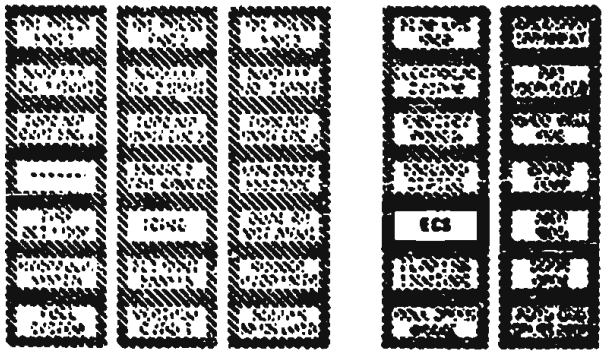
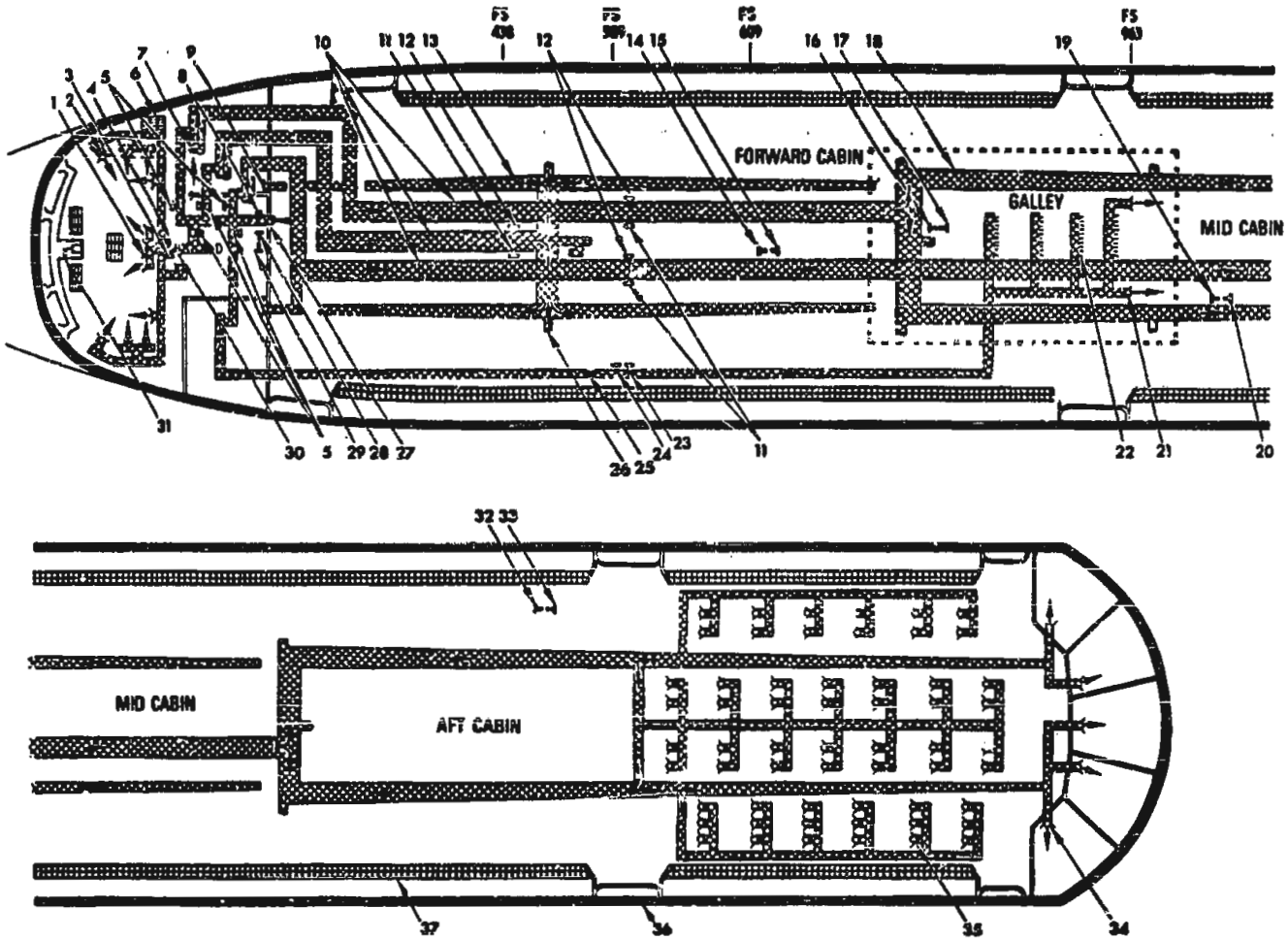




(D)
PILOTS ANNUNCIATOR PANEL

Integrated Pneumatic System Control Panels
Figure 4 (Sheet 2)

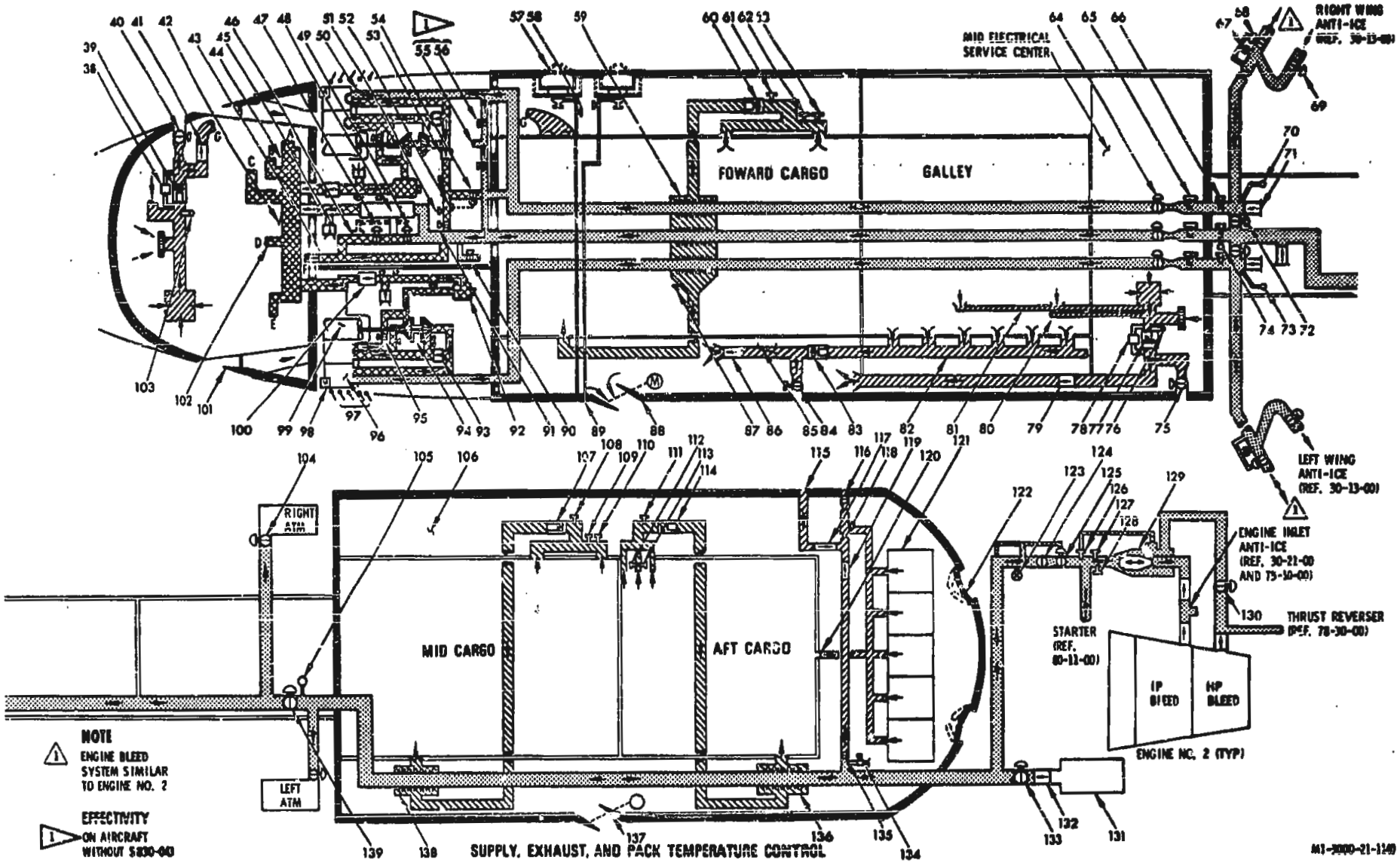


1 FLIGHT STATION FRESH AIR OUTLET (3) (21-22)
2 FLIGHT CREW INDIVIDUAL AIR OUTLET (5) (21-22)
3 FLIGHT STATION DUCT TEMPERATURE SENSOR (21-63)
4 FLIGHT STATION DUCT TEMPERATURE SENSOR (21-63)
5 ZONE TRIM CONTROL VALVE (5) (21-61)
6 FLIGHT STATION EXHAUST TO FWD ELECTRONICS (TYP) (21-22)
7 TYPICAL CONNECTION TO COLD AIR PLENUM FROM SUPPLY, EXHAUST, AND PACK TEMPERATURE CONTROL (6 PLACES)
8 HOT MANIFOLD DUCT OVER TEMPERATURE SWITCH (21-41)
9 FWD LAVATORY INDIVIDUAL AIR OUTLET (2) (21-26)
10 CABIN OVERHEAD DISTRIBUTION DUCTS (5)
11 CABIN DUCT TEMPERATURE SENSORS (3) (21-63)
12 CABIN DUCT TEMPERATURE SENSORS (3) (21-63)
13 FORWARD CABIN DISTRIBUTION DUCT (21-25)
14 FWD CABIN ZONE TEMPERATURE SENSOR (21-61)
15 FORWARD CABIN ZONE TEMPERATURE SENSOR (21-63)
16 GALLEY ZONE TEMPERATURE SENSOR (21-61)
17 GALLEY ZONE TEMPERATURE SENSOR (21-63)
18 MID CABIN DISTRIBUTION DUCT (21-25)
19 MID CABIN ZONE TEMPERATURE SENSOR (21-61)
20 MID CABIN ZONE TEMPERATURE SENSOR (21-63)
21 GALLEY INDIVIDUAL AIR OUTLET (2) (21-26)
22 GALLEY OVERHEAD FRESH AIR OUTLET, AROUND LIGHT FIXTURE (4) (21-26)
23 GALLEY DUCT TEMPERATURE SENSOR (21-61)
24 GALLEY DUCT TEMPERATURE SENSOR (21-63)
25 GALLEY SUPPLY AIR FLOW CONTROL VALVE (21-26)
26 TO PASSENGER INDIVIDUAL AIR OUTLETS (TYP) (21-25)
27 FROM HOT AIR MANIFOLD (21-41)
28 FLIGHT STATION ZONE TEMPERATURE SENSOR (21-61)
29 FLIGHT STATION ZONE TEMPERATURE SENSOR (21-63)
30 FLIGHT STATION SUPPLY AIR FLOW CONTROL VALVE (21-22)
31 WINDSHIELD DEFOG FAN (30-41)
32 AFT CABIN ZONE TEMPERATURE SENSOR (21-61)
33 AFT CABIN ZONE TEMPERATURE SENSOR (21-63)
34 AFT LAVATORY INDIVIDUAL AIR OUTLET (5) (21-26)
35 PASSENGER INDIVIDUAL AIR OUTLET (TYP) (21-25)
36 CABIN DOOR (8)
37 FLOOR LEVEL CABIN AIR EXHAUST GRILLE (TYP) (21-25)

PNEUMATIC SUPPLY/DISTRIBUTION SYSTEM AIR
AIR CONDITIONING SUPPLY AND DISTRIBUTION
VENTILATION/EXHAUST AIR
CARGO HEAT SYSTEM RECIRCULATED AIR
PRESSURE ENVELOPE

Integrated Pneumatic System Schematic
Figure 5 (Sheet 1)

R
R
0016 EFFECTIVITY: ALL



R R Integrated Pneumatic System Schematic
Figure 5 (Sheet 2)

R EFFECTIVITY: WITHOUT SB36-018

R R 001B

1 THRU 37 SEE SHEET 1

38 FORWARD ELECTRONIC EXHAUST DIFFERENTIAL PRESSURE SWITCH (21-25)
39 FORWARD ELECTRONIC EXHAUST FAN (21-25)
40 FORWARD ELECTRONIC EXHAUST CONTROL VALVE (21-25)
41 FORWARD ELECTRONIC EXHAUST CHECK VALVE (21-25)
42 COLD AIR PLENUM RELIEF VALVE (21-51)
43 ZONE TRIM HOT AIR DISCHARGE CHECK VALVE (21-41)
44 COLD AIR PLENUM (21-51)
45 PRECONDITIONED GROUND AIR CONNECTION (2) (21-21)
46 HOT AIR TEMPERATURE CONTROL SENSOR NO. 2 (21-41)
47 HOT MANIFOLD ISOLATION VALVE NO. 2 (21-41)
48 AIR CYCLE PACK NO. 2 (SAME AS NO. 3)
49 HOT AIR TEMPERATURE CONTROL VALVE NO. 2 (21-41)
50 AIR CYCLE PACK NO. 3 (21-51)
51 HOT MANIFOLD TEMPERATURE SENSOR (2) (21-63)
52 HOT AIR TEMPERATURE CONTROL SENSOR (2) (21-41)
53 HOT AIR MIXING CHECK VALVE (2) (21-41)
54 HOT AIR TEMPERATURE CONTROL VALVE (2) (21-41)
55 VHF ANTENNA ANTI-ICE DUCT (30-51)] <1
56 VHF ANTENNA ANTI-ICE VALVE (2) (30-51)]
57 CABIN SAFETY VALVE (2) (21-32)
58 CABIN SAFETY VALVE CONDENSATE BOTTLE (2) (21-32)
59 FORWARD CARGO HEAT EXCHANGER (21-44)
60 FORWARD CARGO FAN (21-44)
61 FORWARD CARGO OVERTEMPERATURE SWITCH (21-44)
62 FORWARD CARGO COLD TEMPERATURE SWITCH (21-44)
63 FOPWARD CARGO FAN CYCLE TEMP SWITCH (21-44)
64 PACK FLOW CONTROL VALVE (3) (21-21)
65 PACK EXCESS FLOW SENSOR/BLEED AIR DIFFERENTIAL PRESSURE SWITCH (3) (36-14)
66 PACK INLET TEMPERATURE SENSOR (3) (21-63)
67 WING ENG BLEED AIR PRESS RELIEF VALVE (36-11)
68 ENGINE ISOLATION VALVE (ENG NO. 1 AND NO. 3)
69 WING ANTI-ICE CONTROL VALVE (2) (31-31)
70 NO. 3 BLEED AIR PRESSURE TRANSMITTER (36-21)
71 HIGH PRESSURE GROUND CONNECTION (3) (36-13)
72 CROSS BLEED DUCT ISOLATION VALVE (2) (36-14)
73 NO. 1 BLEED AIR PRESSURE TRANSDUCER (36-21)
74 AMT PRIORITY SWITCH (21-21)
75 MESC EXHAUST CONTROL VALVE (21-25)
76 MESC EXHAUST AIR FLOW SENSOR (21-25)
77 MESC EXHAUST FAN (21-25)
78 MESC EXHAUST DIFF PRESSURE SWITCH (21-25)
79 MESC EXHAUST DUCT CHECK VALVE (21-25)
80 GALLEY SMOKE DETECTOR AIR/SMOKE INLET (26-15)
81 GALLEY CO2 VENT SYSTEM (21-24)
82 GALLEY EXHAUST SYSTEM (21-24)
83 GALLEY EXHAUST FAN (21-24)
84 GALLEY EXHAUST AIR FLOW CONTROL VALVE (21-24)
85 GALLEY EXHAUST DUCT INFLOW RELIEF VALVE (21-24)
86 GALLEY EXHAUST DUCT CHECK VALVE (21-24)
87 FORWARD CARGO DUCT AREA OVHT SWITCH (36-21)
88 FORWARD OUTFLOW VALVE (21-31)
89 CABIN SAFETY VALVE STATIC PORT (2) (21-32)
90 FORWARD LAVATORY VENT AIR CONTROL VALVE (21-26)
91 HOT MANIFOLD ISOLATION VALVE NO. 3 (21-41)
92 WATER SEPARATOR (3) (21-51)
93 COMPRESSOR BYPASS CHECK VALVE (3) (21-51)
94 AIR CYCLE MACHINE (3) (21-51)
95 TURBINE BYPASS VALVE (3) (21-62)
96 DUAL HEAT EXCHANGER (3) (21-51)
97 RAM AIR EXHAUST VALVE (3) (21-62)
98 RAM AIR EXHAUST CONTROL ACTUATOR (3) (21-62)
99 RAM AIR COOLING HEADER AND CHECK VALVE (3) (21-62)
100 PACK DISCHARGE CHECK VALVE (3) (21-51)
101 RAM AIR INLET DOOR (3) (21-62)
102 TYPICAL CONNECTION TO ZONE TEMPERATURE CONTROL, DISTRIBUTION, AND CABIN EXHAUST (6 PLACES)
103 FWD ELECTRONIC EXH AIR FLOW SENSOR (21-25)
104 ATM CONTROL VALVE (2) (29-11)
105 NO. 2 BLEED AIR PRESSURE TRANSMITTER (36-21)
106 AREA OUTBD OF AND BELOW CARGO COMPT (TYP)
107 MID CARGO FAN (21-44)
108 MID CARGO OVERTEMPERATURE SWITCH (21-44)
109 MID CARGO TEMPERATURE SWITCH (21-44)
110 MID CARGO FAN CYCLE SWITCH (21-44)
111 AFT CARGO OVERTEMPERATURE SWITCH (21-44)
112 AFT CARGO COLD TEMPERATURE SWITCH (21-44)
113 AFT CARGO FAN CYCLE SWITCH (21-44)
114 AFT CARGO FAN (21-44)
115 AFT LAVATORY GROUND VENT AIR CONNECTION (21-26)
116 AFT LAVATORY EXHAUST FLOW CONTROL VALVE (21-26)
117 AFT LAVATORY GROUND VENT CHECK VALVE (21-26)
118 AFT LAVATORY VENT AIR JET PUMP (21-26)
119 AFT LAVATORY VENT AIR CHECK VALVE (21-26)
120 AFT CARGO PET AIR EXHAUST CHECK VALVE (21-26)
121 AFT LAVATORY EXHAUST SYSTEM (21-26)
122 NEGATIVE PRESSURE RELIEF VALVE (2) (21-32)
123 OVERPRESSURE RELIEF VALVE (36-11)
124 HIGH-PRESSURE OVERPRESSURE SHUTOFF VALVE (36-11)
125 ENGINE ISOLATION VALVE (ENG NO. 2) (36-11)
126 MIXING EJECTOR PNEU TEMP SENSOR (36-11)
127 BLEED AIR OVERTEMP SWITCH (2 EACH SYSTEM) (36-11)
128 BLEED TEMPERATURE SEQUENCE SWITCH (36-11)
129 BLEED AIR MIXING EJECTOR (36-11)
130 ENGINE HIGH PRESSURE BLEED VALVE (36-11)
131 APU LOAD COMPRESSOR (49-00)
132 APU LOAD COMPRESSOR DUCT CHECK VALVE (49-51)
133 APU LOAD COMPRESSOR DUCT ISOLATION VALVE (36-12)
134 AFT WASTE COMPT HEAT (AFT LAV UNDERFLOOR) (30-71)
135 AFT LAVATORY VENT AIR CONTROL VALVE (21-26)
136 AFT CARGO HEAT EXCHANGER (21-44)
137 AFT OUTFLOW VALVE (21-31)
138 MID CARGO HEAT EXCHANGER (21-44)
139 AFT FUSELAGE DUCT ISOLATION VALVE (36-14)

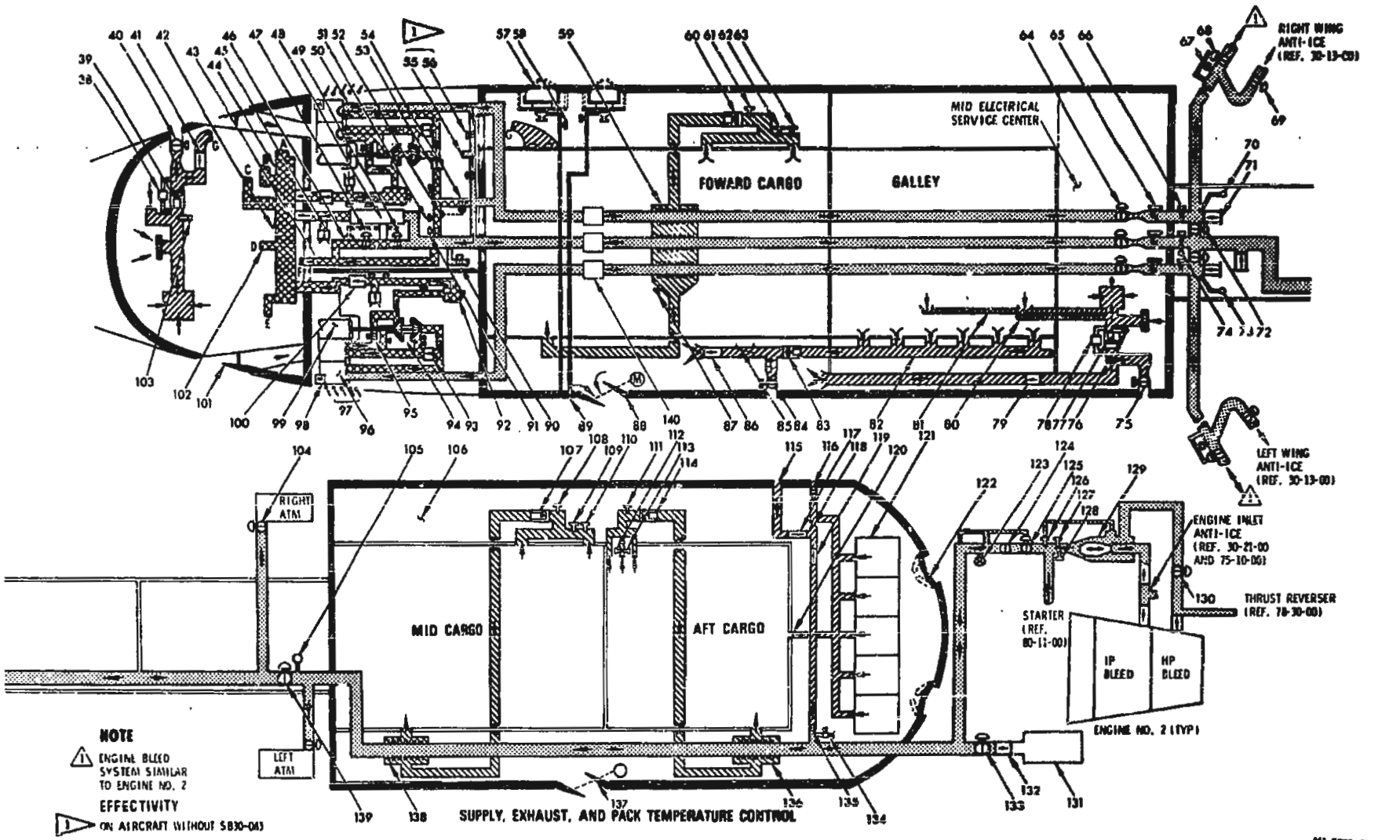
EFFECTIVITY

<1> ON AIRCRAFT WITHOUT SB30-043

M1-5000-21-1132

R Integrated Pneumatic System Component Listing
R Figure 5 (Sheet 3)

EFFECTIVITY: WITHOUT SB36-018



Integrated Pneumatic System Schematic
Figure 5 (Sheet 2)

EFFECTIVITY: WITH SB36-018

1 THRU 37 SEE SHEET 1

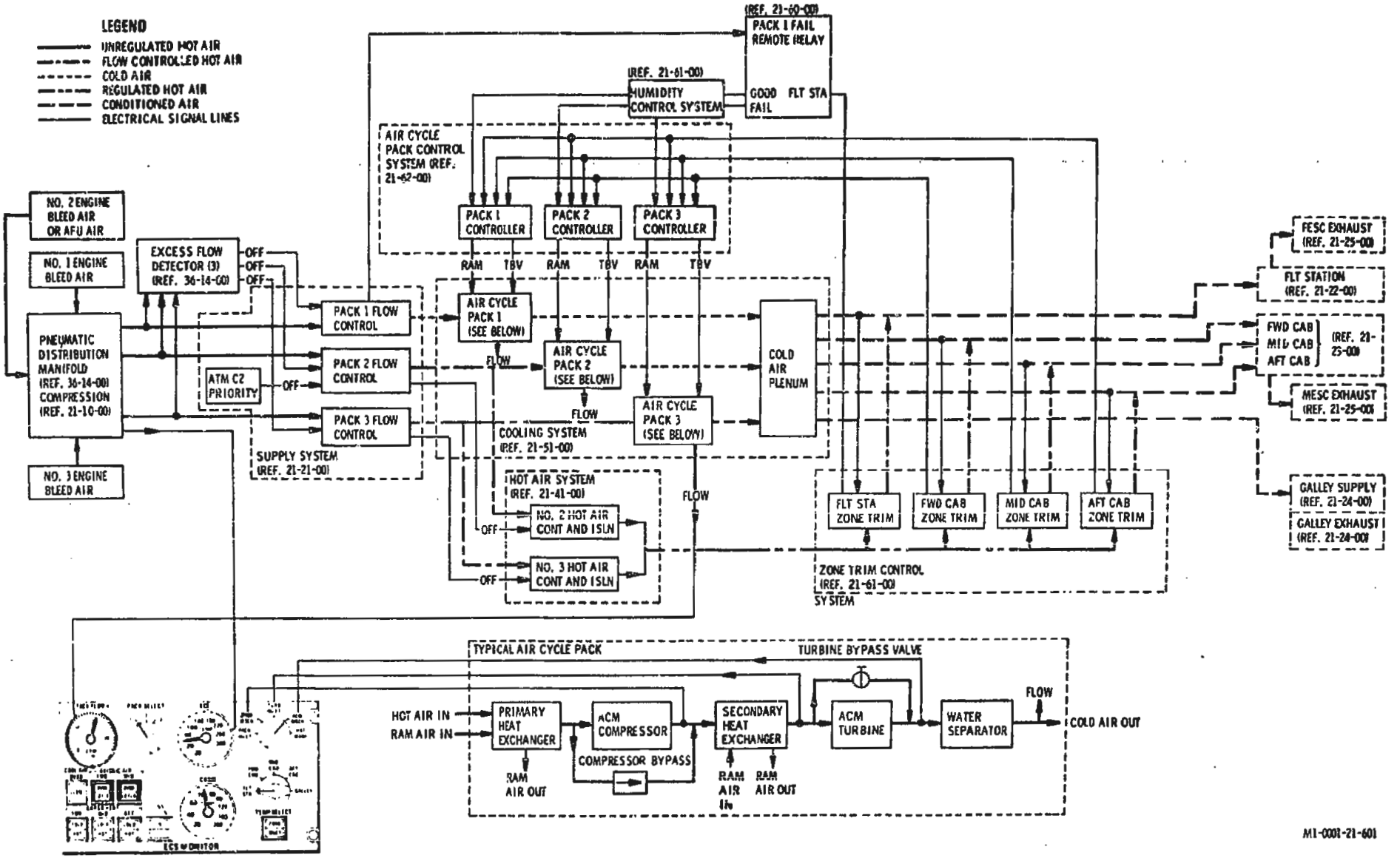
38 FORWARD ELECTRONIC EXHAUST DIFFERENTIAL PRESSURE SWITCH (21-25)
39 FORWARD ELECTRONIC EXHAUST FAN (21-25)
40 FORWARD ELECTRONIC EXHAUST CONTROL VALVE (21-25)
41 FORWARD ELECTRONIC EXHAUST CHECK VALVE (21-25)
42 COLD AIR PLENUM RELIEF VALVE (21-51)
43 ZONE TRIM HOT AIR DISCHARGE CHECK VALVE (21-41)
44 COLD AIR PLENUM (21-51)
45 PRECONDITIONED GROUND AIR CONNECTION (2) (21-21)
46 HOT AIR TEMPERATURE CONTROL SENSOR NO. 2 (21-41)
47 HOT MANIFOLD ISOLATION VALVE NO. 2 (21-41)
48 AIR CYCLE PACK NO. 2 (SAME AS NO. 3)
49 HOT AIR TEMPERATURE CONTROL VALVE NO. 2 (21-41)
50 AIR CYCLE PACK NO. 3 (21-51)
51 HOT MANIFOLD TEMPERATURE SENSOR (2) (21-63)
52 HOT AIR TEMPERATURE CONTROL SENSOR (2) (21-41)
53 HOT AIR MIXING CHECK VALVE (2) (21-41)
54 HOT AIR TEMPERATURE CONTROL VALVE (2) (21-41)
55 VHF ANTENNA ANTI-ICE DUCT (30-51) } 1
56 VHF ANTENNA ANTI-ICE VALVE (2) (30-51) }
57 CABIN SAFETY VALVE (2) (21-32)
58 CABIN SAFETY VALVE CONDENSATE BOTTLE (2) (21-32)
59 FORWARD CARGO HEAT EXCHANGER (21-44)
60 FORWARD CARGO FAN (21-44)
61 FORWARD CARGO OVERTEMPERATURE SWITCH (21-44)
62 FORWARD CARGO COLD TEMPERATURE SWITCH (21-44)
63 FORWARD CARGO FAN CYCLE TEMPERATURE SWITCH (21-44)
64 PACK FLOW CONTROL VALVE (3) (21-21)
65 PACK EXCESS FLOW SENSOR/BLEED AIR DIFFERENTIAL PRESSURE SWITCH (3) (36-14)
66 PACK INLET TEMPERATURE SENSOR (3) (21-63)
67 WING ENGINE BLEED AIR PRESSURE RELIEF VALVE (36-11)
68 ENGINE ISOLATION VALVE (ENG NO. 1 AND NO. 3)
69 WING ANTI-ICE CONTROL VALVE (2) (31-13)
70 NO. 3 BLEED AIR PRESSURE TRANSMITTER (36-21)
71 HIGH PRESSURE GROUND CONNECTION (3) (36-13)
72 CROSS BLEED DUCT ISOLATION VALVE (2) (36-14)
73 NO. 1 BLEED AIR PRESSURE TRANSDUCER (36-21)
74 ASIT PRIORITY SWITCH (21-21)
75 MID ELECTRICAL SERVICE CENTER EXHAUST CONTROL VALVE (21-25)
76 MID ELECTRICAL SERVICE CENTER EXHAUST AIR FLOW SENSOR (21-25)
77 MID ELECTRICAL SERVICE CENTER EXHAUST FAN (21-25)
78 MID ELECTRICAL SERVICE CENTER EXHAUST DIFFERENTIAL PRESSURE SWITCH (21-25)
79 MID ELECTRICAL SERVICE CENTER EXHAUST DUCT CHECK VALVE (21-25)
80 GALLEY SMOKE DETECTOR AIR/SMOKE INLET (26-15)
81 GALLEY CO2 VENT SYSTEM (21-24)
82 GALLEY EXHAUST SYSTEM (21-24)
83 GALLEY EXHAUST FAN (21-24)
84 GALLEY EXHAUST AIR FLOW CONTROL VALVE (21-24)
85 GALLEY EXHAUST DUCT INFLOW RELIEF VALVE (21-24)
86 GALLEY EXHAUST DUCT CHECK VALVE (21-24)
87 FORWARD CARGO DUCT LEAK AREA OVERHEAT SWITCH (36-21)
88 FORWARD OUTFLOW VALVE (21-31)
89 CABIN SAFETY VALVE STATIC PORT (2) (21-32)
90 FORWARD LAVATORY VENT AIR CONTROL VALVE (21-26)
91 HOT MANIFOLD ISOLATION VALVE NO. 3 (21-41)
92 WATER SEPARATOR (3) (21-51)
93 COMPRESSOR BYPASS CHECK VALVE (3) (21-51)
94 AIR CYCLE MACHINE (3) (21-51)
95 TURBINE BYPASS VALVE (3) (21-62)
96 DUAL HEAT EXCHANGER (3) (21-51)
97 RAM AIR EXHAUST VALVE (3) (21-62)
98 RAM AIR EXHAUST CONTROL ACTUATOR (3) (21-62)
99 RAM AIR COOLING HEADER AND CHECK VALVE (3) (21-62)
100 PACK DISCHARGE CHECK VALVE (3) (21-51)
101 RAM AIR INLET DOOR (3) (21-62)
102 TYPICAL CONNECTION TO ZONE TEMPERATURE CONTROL, DISTRIBUTION, AND CABIN EXHAUST (6 PLACES)
103 FORWARD ELECTRONIC EXHAUST AIR FLOW SENSOR (21-25)
104 ATM CONTROL VALVE (2) (29-11)
105 NO. 2 BLEED AIR PRESSURE TRANSMITTER (36-21)
106 AREA OUTBD OF AND BELOW CARGO COMPT (TYP)
107 MID CARGO FAN (21-44)
108 MID CARGO OVERTEMPERATURE SWITCH (21-44)
109 MID CARGO TEMPERATURE SWITCH (21-44)
110 MID CARGO FAN CYCLE SWITCH (21-44)
111 AFT CARGO OVERTEMPERATURE SWITCH (21-44)
112 AFT CARGO COLD TEMPERATURE SWITCH (21-44)
113 AFT CARGO FAN CYCLE SWITCH (21-44)
114 AFT CARGO FAN (21-44)
115 AFT LAVATORY GROUND VENT AIR CONNECTION (21-26)
116 AFT LAVATORY EXHAUST FLOW CONTROL VALVE (21-26)
117 AFT LAVATORY GROUND VENT CHECK VALVE (21-26)
118 AFT LAVATORY VENT AIR JET PUMP (21-26)
119 AFT LAVATORY VENT AIR CHECK VALVE (21-26)
120 AFT CARGO PET AIR EXHAUST CHECK VALVE (21-26)
121 AFT LAVATORY EXHAUST SYSTEM (21-26)
122 NEGATIVE PRESSURE RELIEF VALVE (2) (21-32)
123 OVERPRESSURE RELIEF VALVE (36-11)
124 HP OVERPRESSURE SHUTOFF VALVE (36-11)
125 ENGINE ISOLATION VALVE (ENG NO. 2) (36-11)
126 MIXING EJECTOR PNEU TEMP SENSOR (36-11)
127 BLEED AIR OVERTEMP SWITCH (2 EA SYSTEM) (36-11)
128 BLEED TEMPERATURE SEQUENCE SWITCH (36-11)
129 BLEED AIR MIXING EJECTOR (36-11)
130 ENGINE HIGH PRESSURE BLEED VALVE (36-11)
131 APU LOAD COMPRESSOR (49-00)
132 APU LOAD COMPRESSOR DUCT CHECK VALVE (49-51)
133 APU LOAD COMPRESSOR DUCT ISOLATION VALVE (36-12)
134 AFT WASTE COMPT HEAT (AFT LAV UNDERFLOOR) (30-71)
135 AFT LAVATORY VENT AIR CONTROL VALVE (21-26)
136 AFT CARGO HEAT EXCHANGER (21-44)
137 AFT OUTFLOW VALVE (21-31)
138 MID CARGO HEAT EXCHANGER (21-44)
139 AFT FUSELAGE DUCT ISOLATION VALVE (36-14)
140 BLEED AIR CLEANER (3) (21-21)

1 EFFECTIVITY ON AIRCRAFT WITHOUT SB30-043

M1-5001-21-098

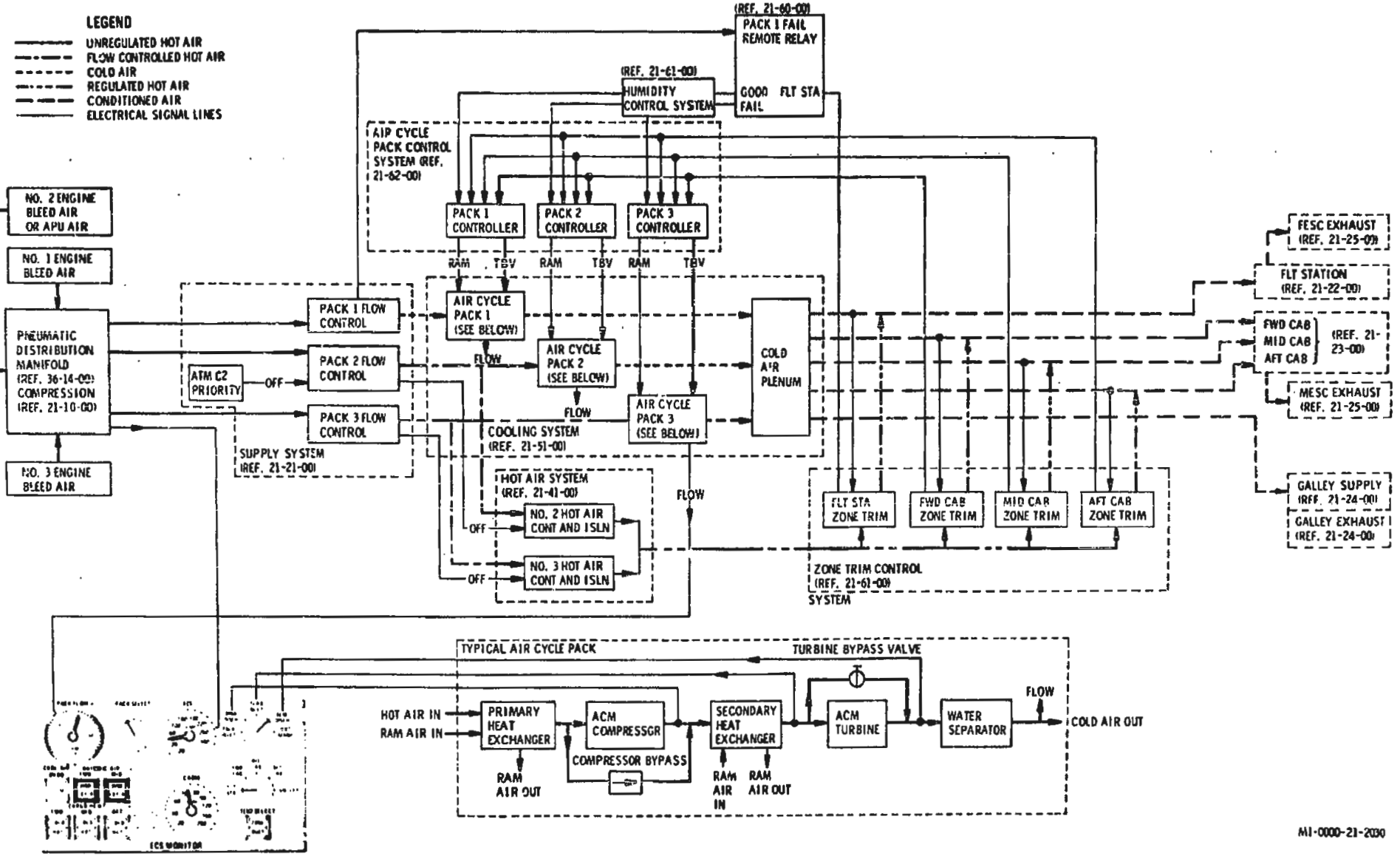
Integrated Pneumatic System Component Listing
Figure 5 (Sheet 3)

R EFFECTIVITY: WITH SB36-018
R
C018



Air Conditioning System - Block Diagram
Figure 6

EFFECTIVITY: 001-033



R Air Conditioning System - Block Diagram
R Figure 6

R EFFECTIVITY: 034-999

001B

AIR CONDITIONING SYSTEM - MAINTENANCE PRACTICES

1. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
24-24-00	APU Generator System - Maintenance Practices
29-11-00	Hydraulic Power System - Maintenance Practices
30-51-00	VHF Antenna Anti-Ice System - Maintenance Practices (On aircraft without SB30-043)
36-00-00	Pneumatic System - Maintenance Practices
49-00-00	Airborne Auxiliary Power - Maintenance Practices
80-11-00	Engine Starting System - Maintenance Practices

2. Maintenance Practices

This maintenance practice contains the procedures for operating the air conditioning system in various modes. The procedures are presented in tabular form, listing the control, its location, the required action, and the normal resulting flight station indication. If more detailed information is required, refer to the applicable subsystem section.

These procedures assume that all systems are properly serviced and operational. If the indications obtained are not as listed, refer to the applicable fault isolation procedure. Further assumption is made that electrical power is on the aircraft buses (Ref. 24-00-00 and 24-24-00) and that all required circuit breakers are closed (Ref. Table 201 for air conditioning system breakers). Before applying pneumatic pressure, ensure that all interfacing systems can be operated safely. The hydraulic power
R system air turbine motors (ATM) (Ref. 29-11-00) and, on aircraft
R 001-031 without SB30-043, the VHF antenna anti-ice system (Ref.
R 30-51-00) will receive pneumatic pressure during operation of the air conditioning system.

3. Air Conditioning System Operating Procedures

The following procedures are covered in the indicated tables:

Table 201 Preparation for Air Conditioning System Operation

Table 202 Operation of Avionics Cooling Air

Table 203	Operation on Preconditioned Ground Air
Table 204	Operation on High-pressure Ground Air
Table 205	Operation on APU Air
Table 206	Operation on Engine Bleed Air

The following abbreviations are used in the location column of the tables:

BF-FS	Bottom of fuselage at fuselage station
CB1	Pilots overhead circuit breaker panel, zone 210
CB2	Flight Engineer/Second Officers overhead circuit breaker panel, zone 215
CB3	Flight Engineer/Second Officers aft circuit breaker panel, zone 215
CPC	CABIN PRESSURE CONTROL panel, zone 215
CTC	CABIN TEMP CONTROL panel, zone 215
EBC	ENGINE BLEED CONTROL panel, zone 215
ECSM	ECS MONITOR panel, zone 215
GLCB	Galley left circuit breaker panel, zone 130
GRCB	Galley right circuit breaker panel, zone 130
HSCP	HYDRAULIC SYSTEM control panel, zone 215

Preparation for Air Conditioning System Operation
Table 201

CIRCUIT BREAKER	CB PANEL	PROCEDURE TABLE NUMBER				
		202	203	204	205	206
NOTE: All circuit breakers marked CLOSE must be closed for that mode of operation. All others may be closed or open, as desired.						
AIR - OVBD (J14)	CB1	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONTROL - FWD (H1)	CB1	----	----	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONTROL - AFT (H2)	CB1	----	----	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3)	CB1	----	----	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4)	CB1	----	----	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5)	CB1	----	----	CLOSE	CLOSE	CLOSE
ENVIR CONTROL SYSTEM - PACK - HI FLOW - CONT (H6)	CB1	----	----	CLOSE	CLOSE	CLOSE
GROUND SERVICE - AVIONICS - AIR - MON (L5)	CB2	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE
CABIN PRESSURE CONT - AUTO - CONT (A9)	CB3	----	----	CLOSE	CLOSE	CLOSE

Preparation for Air Conditioning System Operation (Cont)
Table 201

CIRCUIT BREAKER	CB PANEL	PROCEDURE TABLE NUMBER				
		202	203	204	205	206
CABIN PRESSURE CONT - AUTO - PWR (X10)	CB3	----	----	CLOSE	CLOSE	CLOSE
CABIN PRESSURE - STBY - CONT (X11)	CB3	----	----	CLOSE	CLOSE	CLOSE
CABIN PRESSURE CONT - STBY - PWR (X12)	CB3	----	----	CLOSE	CLOSE	CLOSE
OUTFLOW VALVE - FWD (X14)	CB3	CLOSE	CLOSE	CLOSE	CLOSE	---
OUTFLOW VALVE - AFT (X17)	CB3	CLOSE	----	CLOSE	CLOSE	CLOSE
HOT AIR MANF - IND (W5)	CB3	----	----	CLOSE	CLOSE	CLOSE
HOT AIR MANF - TEMP - CONT (W6)	CB3	----	----	CLOSE	CLOSE	CLOSE
HOT AIR MANF - ISLN - NO. 2 (W7)	CB3	----	----	CLOSE	CLOSE	CLOSE
HOT AIR MANF - ISLN - NO. 3 (W8)	CB3	----	----	CLOSE	CLOSE	CLOSE
CARGO TEMP - FWD - MID (W9)	CB3	----	----	CLOSE	CLOSE	CLOSE
CARGO TEMP - AFT (W10)	CB3	----	----	CLOSE	CLOSE	CLOSE
R FLOOR HEAT - CONT (W11) (On aircraft R without SB21-158 R or 001-031 without R SB21-228)	CB3	----	----	CLOSE	CLOSE	CLOSE
DUCT AREA - OVHT DET - DC (W13)	CB3	----	----	CLOSE	CLOSE	CLOSE

Preparation for Air Conditioning System Operation (Cont)
Table 201

	CIRCUIT BREAKER	CB PANEL	PROCEDURE TABLE NUMBER				
			202	203	204	205	206
	DUCT AREA - OVHT DET - AC (W14)	CB3	----	----	CLOSE	CLOSE	CLOSE
R	ECS - AIR TEMP - IND (V1)	CB3	----	----	CLOSE	CLOSE	CLOSE
	TEMP CONT - FLT STA - DC (V3)	CB3	----	----	CLOSE	CLOSE	CLOSE
	TEMP CONT - FLT STA - AC (V4)	CB3	----	----	CLOSE	CLOSE	CLOSE
	PACK 1 - AUTO/MAN - DC (V5)	CB3	----	----	CLOSE	CLOSE	CLOSE
	PACK 1 - AUTO/MAN - AC (V6)	CB3	----	----	CLOSE	CLOSE	CLOSE
	PACK 2 - AUTO/MAN - DC (V7)	CB3	----	----	CLOSE	CLOSE	CLOSE
	PACK 2 - AUTO/MAN - AC (V8)	CB3	----	----	CLOSE	CLOSE	CLOSE
	ZONE CENTER TEMPERATURE CONTROL - FWD CAB - DC (V9)	CB3	----	----	CLOSE	CLOSE	CLOSE
	ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10)	CB3	----	----	CLOSE	CLOSE	CLOSE
	ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V11)	CB3	----	----	CLOSE	CLOSE	CLOSE
	ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V12)	CB3	----	----	CLOSE	CLOSE	CLOSE

Preparation for Air Conditioning System Operation (Cont)
Table 201

CIRCUIT BREAKER	CB PANEL	PROCEDURE TABLE NUMBER				
		202	203	204	205	206
ZONE CENTER TEMPERATURE CONTROL - AFT CAB - DC (V13)	CB3	----	----	CLOSE	CLOSE	CLOSE
ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14)	CB3	----	----	CLOSE	CLOSE	CLOSE
ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15)	CB3	----	----	CLOSE	CLOSE	CLOSE
ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16)	CB3	----	----	CLOSE	CLOSE	CLOSE
PACK 3 - AUTO/MAN - DC (V17)	CB3	----	----	CLOSE	CLOSE	CLOSE
PACK 3 - AUTO/MAN - AC (V18)	CB3	----	----	CLOSE	CLOSE	CLOSE
BLEED - AIR - IND (R17)	CB3	----	----	CLOSE	CLOSE	CLOSE
FAN - AVIONICS - RACK - MAIN (D14)	GLCB	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE
FWD AVIONICS - FAN (E15)	GRCB	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE
INSTR - COOLING (A-21)	CB2	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE

Operation of Avionics Cooling Air
Table 202

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	NOTE: Avionic cooling air must be provided whenever the electrical system is energized and the ECS system is not being used for cooling and ventilation. This cooling will be provided automatically with application of electrical power if the following conditions exist.			
1	COOL AIR OVBD switchlight	ECSM	Depressed (in)	CLOSE indicator in switchlight off
2	AVIONIC AIR - FWD and MID indicator lights	ECSM	Observe	OVBD indicators on, LO FLO indicators off

Operation on Preconditioned Ground Air
Table 203

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
1	Preconditioned ground air connections	BF-FS420	Connect 1 or 2 preconditioned low-pressure air sources, as required	None
2	Preconditioned ground air source	----	Start and adjust for required temperature	Airflow throughout the cabin and flight station
	NOTE: If other sources of pneumatic pressure are activated, the preconditioned ground air check valves will close and prevent back flow of air into the ground unit. The low-pressure ground air connections can be installed or removed with any of the other pneumatic sources operating.			
3	Preconditioned ground air source	----	Shut down	Airflow in the cabin stops, unless another air source is operating
4	Preconditioned ground air connections	BF-FS420	Disconnect hose and secure access door	None

Operation on High-pressure Ground Air
Table 204

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
		NOTE: If the ECS is already operating on engine or APU air, begin this procedure at Step 29. The ground air will automatically take over when other sources are shut down.			
	1	Fuselage ISLN VALVE switchlight	EBC	Released (out)	OFF light in switchlight on
	2	CROSS BLEED switchlights (2)	EBC	Position as needed	OFF light on if valve is selected closed. OFF light off if valve selected open, valve opens when pressure is available.
	3	PACK FLOW CONTROL switchlights (3)	CTC	Released (out)	Switchlight position
	4	AUTO/MNL switchlights (3)	CTC	Depressed (in)	AUTO indicator on, MNL off
	5	HOT AIR switchlights (2)	CTC	Depressed (in)	OFF light in switchlight off, flow bar comes on when pressure is available
	6	Hot air manifold ISLN Valve switchlights (2)	CTC	Depressed (in)	Switchlight position
	7	GND CONT switchlight	CTC	Released (out) in cold weather for rapid warm up, depressed (in) in warm weather	RAM AUTO light on when switchlight is released and off when switchlight is depressed
R	8	Zone trim valve switchlights (5)	CTC	Depressed (in)	CLOSE light off

Operation on High-pressure Ground Air (Cont)
Table 204

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	9	Zone trim temperature selectors (5)	CTC	As desired	Pointer position
R	10	FLOOR HEAT switchlight (if installed)	CTC	Released (Out)	OFF light on
	11	AREA OVHT selector	CTC	Place in position A	Pointer position
	12	AREA OVHT TEST switch	CTC	Press and release	7 AREA OVHT lights on EBC/CTC panel, 2 DUCT FAIL lights on pilots WING ANTI-ICE PANEL, and the AREA/DUCT OVHT light on the pilots annunciator panel come on while switch is held
	13	AREA OVHT selector	CTC	Place in position B	Pointer position
	14	AREA OVHT TEST switch	CTC	Press and release	Same as Step 12
	15	AREA OVHT selector	CTC	Place in BOTH position	Pointer position

Operation on High-pressure Ground Air (Cont)
Table 204

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	16	CARGO HEAT switchlights (3)	ECSM	Depressed (in)	Switchlights latched in, COLD lights on if cargo compartment temperatures are below 40 degrees F. HOT lights on if compartments are over 95 degrees F.
	17	COOL AIR OVBD switchlight	ESCM	Depressed (in)	CLOSE ligt off
	18	FWD and MID AVIONIC AIR OVBD/LO FLO indicator lights	ECSM	Observe	OVBD lights on, LO FLO lights off
R	19	TEMP SELECT switchlight	ECSM	Released (out)	ZONE light on
	20	CABIN TEMP SELECT selector	ECSM	MID CAB	Pointer position
	21	ECS Temperature selector	ECSM	ACM DISCH	Pointer position
	22	PACK SELECT selector	ECSM	As desired	Pointer position
	23	MODE SEL switch	CPC	NORM	Pointer position
	24	NORM RATE knob	CPC	Pip point	Pointer position
	25	STBY RATE knob	CPC	HOLD	Pointer position
	26	FWD and AFT MANUAL switchlights	CPC	Released (out)	MNL lights off
	27	BARO SET selector	CPC	Field barometric pressure	Scale reading

Operation on High-pressure Ground Air (Cont)
Table 204

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
28	ALT SET selector	CPC	CAB altitude scale to field elevation or above	Scale reading
	WARNING: PRIOR TO USING A HIGH PRESSURE GROUND AIR CONNECTOR, ENSURE THAT CHECK VALVE FLAPS HAVE FREE AND ADEQUATE MOVEMENT. IF ONE OR MORE FLAPS STICK IN THE OPEN POSITION, MOVE FLAP(S) TO THE SHUT POSITION AND IF POSSIBLE USE AN ALTERNATE CONNECTOR.			
29	High pressure ground air connections	BF-FS983	Connect 1, 2, or 3 ground air sources, as desired	None
	NOTE: If other sources of pneumatic pressure are activated, the high-pressure ground air check valves will close and prevent back flow of air into the ground unit(s). The high-pressure ground air connections can be installed or removed with any of the other pneumatic sources operating.			
30	Ground air sources	----	Turn on	Flow bars in selected CROSSBLEED, PACK FLOW CONTROL, HOT AIR, and hot air manifold ISLN VALVE switchlights come on
CR 31	Deleted			

Operation on High-pressure Ground Air (Cont)
Table 204

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
32	Cabin TEMP SELECT selector	ECSM	Select areas, as desired, and monitor temperatures	Temperatures read as desired, or may be adjusted by operating the five temperature control selectors on the CTC
R R R	WARNING: AVOID DIRECT CONTACT WITH ANY HOT AIR LEAKAGE WHEN DISCONNECTING THE HIGH PRESSURE GROUND AIR SUPPLY FROM THE AIRCRAFT.			
33	Ground air sources	----	Turn off	None if other pneumatic sources are operating. Switchlight flow bar lights go off and airflow stops if other sources are not operating
34	High-pressure ground air connections	BF-FS983	Disconnect ground air sources and secure access doors	None

Operation on APU Air
Table 205

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	NOTE: If the ECS is already operating on engine bleed air, start APU and turn on the APU pneumatic pressure in accordance with 49-00-00. The APU air will automatically take over as the engines are shut down in accordance with 80-11-00. If the ECS is operating on high-pressure ground air, begin this procedure at Step 29.			
1	Fuselage ISLN VALVE switchlight	EBC	Depressed (in)	OFF light in switchlight off
2	CROSS BLEED switchlights (2)	EBC	Position as needed	OFF light on if valve is selected closed. OFF light off if valve is selected open, flow comes on and valve opens when pressure is available
3	PACK FLOW CONTROL switchlights (3)	CTC	Released (out)	Switchlight position
4	AUTO/MNL switchlights (3)	CTC	Depressed (in)	AUTO indicator on, MNL off
5	HOT AIR switchlights (2)	CTC	Depressed (in)	OFF light in switchlight off, flow bar comes on when pressure is available
6	Hot air manifold ISLN VALVE switchlights (2)	CTC	Depressed (in)	Switchlight position
7	GND CONT switchlight	CTC	Released (out) in cold weather for rapid warm up, depressed (in) in warm weather	RAM AUTO light on when switchlight is released and out when switchlight is depressed

Operation on APU Air (Cont)
Table 205

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	8	Zone trim valve switchlights (5)	CTC	Depressed (in)	CLOSE light off
	9	Zone trim temperature selectors (5)	CTC	As desired	Pointer position
	10	FLOOR HEAT switchlight (On aircraft without SB21-158 or 001-031 without SB21-228)	CTC	Depressed (in)	OFF light off
	11	AREA OVHT selector	CTC	Place in position A	Pointer position
	12	AREA OVHT TEST switch	CTC	Press and release	7 AREA OVHT lights on EBC/CTC panel, 2 DUCT FAIL lights on pilots WING ANTI-ICE PANEL, and the AREA/DUCT OVHT light on the pilots annunciator panel come on while switch is held.
	13	AREA OVHT selector	CTC	Place in position B	Pointer position
	14	AREA OVHT TEST switch		Press and release	Same as Step 12
	15	AREA OVHT selector	CTC	Place in BOTH position	Pointer position

Operation on APU Air (Cont)
Table 205

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
16	CARGO HEAT switchlights (3)	ECSM	Depressed (in)	Switchlights latched in, COLD lights on if cargo compartment temperatures are below 40 degrees F. HOT lights on if cargo compartment temperatures are over 95 degrees F.
17	COOL AIR OVBD switchlight	ECSM	Depressed (in)	CLOSE light off
18	FWD and MID AVIONIC AIR OVBD/LO FLO indicator lights	ECSM	Observe	OVBD lights on, LO FLO lights off
19	TEMP SELECT switchlight	ECSM	Released (out)	ZONE light on
20	CABIN TEMP SELECT selector	ECSM	MID CAB	Pointer position
21	ECS Temperature selector	ECSM	ACM DISCH	Pointer position
22	PACK SELECT selector	ECSM	As desired	Pointer position
23	MODE SEL selector	CPC	NORM	Pointer position
24	NORM RATE selector	CPC	Pip point	Pointer position
25	STBY RATE selector	CPC	HOLD	Pointer position
26	FWD and AFT MANUAL switchlights	CPC	Released (out)	MNL lights off
27	BARO SET selector	CPC	Field barometric pressure	Scale reading

Operation on APU Air (Cont)
Table 205

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	28	ALT SET selector	CPC	CAB altitude scale to field elevation or above	Scale reading
	29	APU control panel	Zone 215	Start and operate APU in accordance with 49-00-00	Ref. 49-00-00
CR	30	Deleted			
	31	Cabin TEMP SELECT selector	ECSM	Select areas, as desired, monitor temperatures	Temperatures read as desired, or may be adjusted by operating the five temperature control selectors on the CTC
	32	APU control panel	Zone 215	Shut down APU in accordance with 49-00-00	Ref. 49-00-00

NOTE: The APU may be shut down with any other pneumatic sources operating. If other sources are operating, the ECS system will continue to operate in the appropriate mode.

Operation on Engine Bleed Air
Table 206

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	NOTE: If the ECS is not already operating, or operating on preconditioned ground air, start this procedure at Step 1. If the ECS is operating on the high-pressure ground air or the APU, start at Step 32.			
1	AUTO/MNL switchlights (3)	CTC	Depressed (in)	AUTO indicator on, MNL off
2	HOT AIR switchlights (2)	CTC	Depressed (in)	OFF light in switchlight off, flow bar comes on when pressure is available
3	Hot air manifold ISLN VALVE switchlights (2)	CTC	Depressed (in)	Switchlight position
4	GND CONT switchlight	CTC	Released (out) in cold weather for rapid warm up, depressed (in) in warm weather	RAM AUTO light is on when switchlight is released and out when switchlight is depressed. AUTO light is on when switchlight is released and off when switchlight is depressed
5	Zone trim valve switchlights (5)	CTC	Depressed (in)	CLOSE light off
6	Zone trim temperature selectors (5)	CTC	As desired	Pointer position
R 7	FLOOR HEAT switchlight (On aircraft without SB21-158 or 001-031 without SB21-228)	CTC	Depressed (in)	OFF light off

Operation on Engine Bleed Air (Cont)
Table 206

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
8	AREA OVHT selector	CTC	Place in position A	Pointer position
9	AREA OVHT TEST switch	CTC	Press and release	7 AREA OVHT lights on EBC/CTC panel, 2 DUCT FAIL lights on pilots WING ANTI-ICE PANEL, and the AREA/DUCT OVHT light on the pilots annunciator panel come on while switch is held.
10	AREA OVHT selector	CTC	Place in position B	Pointer position
11	AREA OVHT TEST switch	CTC	Press and release	Same as Step 9
12	AREA OVHT selector	CTC	Place in BOTH position	Pointer position
13	CARGO HEAT switchlights (3)	ECSM	Depressed (in)	Switchlights latched in, COLD lights on if cargo compartment temperatures are below 40 degrees F. HOT lights on if compartment temperatures are over 95 degrees F.
14	COOL AIR OVBD switchlight	ECSM	Depressed (in)	CLOSE light off

Operation on Engine Bleed Air (Cont)
Table 206

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
15	FWD and MID AVIONIC AIR OVBD/LO FLO indicator lights	ECSM	Observe	OVBD lights LO FLO lights off
16	TEMP SELECT switchlight	ECSM	Released (out)	ZONE light on
17	CABIN TEMP SELECT selector	ECSM	MID CAB	Pointer position
18	ECS temperature selector	ECSM	ACM DISCH	Pointer position
19	PACK SELECT selector	ECSM	As desired	Pointer position
20	MODE SEL selector	CPC	NORM	Pointer position
21	NORM RATE selector	CPC	Pip point	Pointer position
22	STBY RATE selector	CPC	HOLD	Pointer position
23	FWD and AFT MANUAL switchlights	CPC	Released (out)	MNL lights off
24	BARO SET selector	CPC	Field barometric pressure	Scale reading
25	ALT SET selector	CPC	CAB altitude scale to field elevation or above	Scale reading
26	Fuselage ISLN VALVE switchlight	EBC	Depressed in if No. 2 engine or APU is used, released (out) if No. 2 engine or APU not being used	OFF light off if switchlight depressed, light on if switchlight released

Operation on Engine Bleed Air (Cont)
Table 206

	CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
27	CROSS BLEED switchlights (2)	EBC	Position as needed	OFF light on if valve is selected closed. OFF light off if valve is selected open, flow comes on, and valve opens when pressure is available.
28	PACK FLOW CONTROL switchlights (3)	CTC	Released (out)	Switchlight position
29	High-pressure ground air connections	BF-FS983	Connect 1, 2, or 3 ground air sources, as desired, if ground air is to be used to start engines	None
30	Ground air sources	----	Turn on	Flow bars in selected CROSSBLEED, PACK FLOW CONTROL, HOT AIR, and hot air manifold ISLN VALVE switchlights come on
31	APU CONTROL panel	Zone 215	Start APU and apply pneumatic pressure in accordance with 49-00-00 if APU air is to be used to start engines	Ref. 49-00-00
32	Engine start system	----	Start engine(s) in accordance with 80-11-00	Ref. 80-11-00

R

Operation on Engine Bleed Air (Cont)
Table 206

		CONTROL OR UNIT	LCTN	ACTION OR CONTROL POSITION	FLT STA INDICATION
	33	ENG ISLN VALVE switchlights (3)	EBC	Depressed (in) for operating engines, released (out) for nonoperating engines	Flow bars on for operating engines, OFF lights on for nonoperating engines
	34	PACK FLOW CONTROL switchlights (3)	CTC	Released (out) to operate associated pack, depressed (in) to shut down associated pack	
CR	35	Deleted			
	36	Cabin TEMP SELECT selector	ECSM	Select areas, as desired, and monitor temperatures	Temperatures read, as desired, or may be adjusted by operating the five temperature control selectors on the CTC
	37	Engine control system	----	Shut down engines in accordance with 80-11-00	Ref. 80-11-00
	38	NOTE: The engines may be shut down with any other pneumatic sources operating. If other sources are operating, the ECS system will continue to operate in appropriate mode.			

Plane_____
Date_____
Station_____

C 4. Environmental Control System (ECS) Check

C A. Preliminary:

C (1) Reliability of this procedure is dependent on ECS temperature indication
C accuracy. To check accuracy, select to Pack 1 and hot manifold; ECS
C indicator should read zero. Replace indicator Stk. Nbr. 35612 if not
C reading zero.

C (2) Asterisk (*) denotes correct indication for each step.

C (3) Before starting, insure all 3 pack flow control valves are selected to off.

C (4) Select humidity control to off.

C (5) Close all required circuit breakers.

C B. Part 1 Pack Performance TAT_____°C

C (1) Operate APU in min mode.

C (2) Select APU isolation valve to open. Open legend * ON_____OFF_____

C (3) Select AFT fuselage isolation valve to open. Flow bar * ON_____ OFF_____

C (4) Select LT and RT crossbleed valves to open. Flow bar LT * ON_____ OFF_____
C RT * ON_____ OFF_____

C (5) Select number 2 and 3 hot air valves closed.

C (6) Select number 2 and 3 manifold isolation valves closed.

C (7) Select APU to normal mode.

C (8) Record duct pressures.

C No. 1_____psig No. 2_____psig No. 3_____psig

CR NOTE: Normal mode pressure should be 18 psig minimum. All three
CR indicators should agree by ±1 psig.

C (9) Operate one pack at a time. Perform and record the following:

C (a) Pack 1

C 1) Select pack control to manual and position turbine bypass valve
C 15 degrees open (3 indicator marks from full cold). M1-0000-21-2100

Plane_____
Date_____
Station_____

C (9) (Continued)

C 2) Select flow control valve to open. Did valve open without help?
C Yes_____No_____Flowbar on? * Yes_____No_____

C 3) No. 1 pack duct pressure_____psig.

C 4) Allow parameters to stabilize for two minutes.

C 5) Record the following temperatures:

C a. Pack inlet _____^{o}C
C b. Compr disch _____^{o}C
C c. Turb inlet _____^{o}C
C d. ACM disch _____^{o}C
C

C 6) Select TBV to full cool and record lowest ACM disch temperature
C attained_____^{o}C.

C 7) Select pack to auto.

C 8) Select flow control valve to close.

C 9) Comments_____

_____

C (b) Pack 2

C 1) Select pack control to manual and position turbine bypass valve 15^{o}
C open (3 indicator marks from full cool).

C 2) Select flow control valve to open. Did valve open without help?
C Yes_____No_____ Flow bar on? * Yes_____No_____

C 3) No. 2 pack duct pressure_____psig.

C 4) Allow parameters to stabilize for two minutes.

M1-0001-21-2190

Plane_____
Date_____
Station_____

C (9) (Continued)

C 2) Select flow control valve to open. Did valve open without help?
C Yes_____No_____Flowbar on? * Yes_____No_____

C 3) No. 1 pack duct pressure_____psig.

C 4) Allow parameters to stabilize for two minutes.

C 5) Record the following temperatures:

C a. Pack inlet _____°C

C b. Compr disch _____°C

C c. Turb inlet _____°C

C d. ACM disch _____°C

C e. Pack flow_____CFM

C 6) Select T&V to full cool and record lowest ACM disch temperature
C attained_____°C.

C 7) Select pack to auto.

C 8) Select flow control valve to close.

C 9) Comments_____

_____

C (b) Pack 2

C 1) Select pack control to manual and position turbine bypass valve 15°
C open (3 indicator marks from full cool).

C 2) Select flow control valve to open. Did valve open without help?
C Yes_____No_____ Flow bar on? * Yes_____No_____

C 3) No. 2 pack duct pressure_____psig.

C 4) Allow parameters to stabilize for two minutes.

M1-7000-21-2180

Plane_____
Date_____
Station_____

C (9) (Continued)

C 5) Record the following temperatures.

C a. Pack inlet _____ °C

C b. Compr Disch _____ °C

C c. Turb inlet _____ °C

C d. ACM disch _____ °C

C

C 6) Select TBV to full cool and record lowest ACM disch temperature
C attained_____ °C.

C 7) Select pack to auto.

C 8) Select flow control valve to close.

C 9) Comments_____

_____

C (c) Pack 3

C 1) Select pack control to manual and position turbine bypass valve
C 15 degrees open (3 indicator marks from full cool).

C 2) Select flow control valve to open. Did valve open without help?
C Yes_____No_____Flow bar on? Yes_____No_____

C 3) No. 3 pack duct pressure_____ psig.

C 4) Allow parameters to stabilize for two minutes.

C 5) Record the following temperatures:

C a. Pack inlet _____ °C

C b. Compr disch _____ °C

C c. Turb inlet _____ °C

C d. ACM disch _____ °C

C

M1-0001-21-2191

Plane_____
Date_____
Station_____

C (9) (Continued)

C 6) Select TBV to full cool and record lowest ACM disch temperature
C attained_____°C.

C 7) Select pack to auto.

C 8) Select flow control valve to close.

C 9) Comments_____

_____

C 10) Select all 3 pack flow control valves to open, allow 2 minutes
C for temperatures to stabilize.

C 11) Record all 3 ACM disch temperatures.

C No. 1_____°C No. 2_____°C No. 3_____°C

C NOTE: All temperatures should be the same, within 5°C, for the
C same TBV position. If any temperature reads 15 to 20°C,
C greater than the other, the compressor bypass check valve
C is suspect of failure P/N 280-0007, especially if the res-
C pective TBV is at its full cool position.

C 12) Select ram auto gnd cont to on. Do all 3 cooling doors drive
C toward warm? * Yes_____ No_____

C 13) Select ram auto gnd cont to off. Do all 3 cooling doors drive
C to cool? * Yes_____No_____

C PART I COMPLETED, CONTINUE TO PART II

C C. Part II Cabin Temperature Control Check

C NOTE: In order to perform a complete check of the cabin temperature control system,
C the zone temperature must be in the normal control range, 65°F to 85°F.

C (1) Operate all 3 packs in auto mode.

C (2) Record zone temperatures:

C FLT STA____°F FWD____°F MID____°F AFT____°F GAL____°F

M1-0000-21-2192

Plane_____
Date_____
Station_____

C (3) Select all cabin control valves to close. Did the close legends illuminate?

C FLT STA * Yes_____No_____ FWD * Yes_____ No_____

C MID * Yes_____ No_____AFT * Yes_____ No_____Galley * Yes_____ No_____

C NOTE: The next step checks cabin controller influence over the packs.
C Select all cabin control temperature selectors to full warm.

C (a) Select FLT STA control valve to open. Do TBV positions move from cool
C to warm? Pack 1 * Yes_____No _____Pack 2 Yes_____* No_____
C Pack 3 Yes_____* No_____
C Select FLT STA control valve to close and allow temperature to stabilize.

C (b) Select FWD CAB control valve to open. Do TBV positions move from cool
C toward warm? Pack 1 * Yes_____No_____ Pack 2 * Yes_____No_____
C Pack 3 * Yes_____No_____
C Select FWD control valve to close and allow temperature to stabilize.

C (c) Select MID CAB control valve to open. Do TBV positions move from cool
C toward warm? Pack 1 * Yes_____No_____Pack 2 * Yes_____No_____
C Pack 3 * Yes_____No_____
C Select MID CAB control valve to close and allow temperature to stabilize.

C (d) Select AFT CAB control valve to open. Do TBV positions move from cool
C towards warm? Pack 1 * Yes_____No_____Pack 2 * Yes_____No_____
C Pack 3 * Yes_____No_____
C Select AFT CAB control valve to close and allow temperature to stabilize.

C (e) Select Galley control valve to open. Do TBV positions move from cool
C toward warm? Pack 1 * Yes_____ No_____Pack 2 Yes_____* No_____
C Pack 3 Yes_____* No_____
C Select Galley control valve to close.

C (f) Comments_____
_____

C (4) Select humidity control to on. Record stabilized ACM disch temperatures.

C Pack 1_____^{o}C Pack 2_____^{o}C Pack 3_____^{o}C

CR NOTE: Stabilized temperature should not exceed +2^{o}C. The next step checks
CR each cabin controller operation to respective temp control valve.
CR Humidity control must be on so that ACM disch temperature does not
CR influence zone duct temp.

M1-0000-21-2183

Plane_____
Date_____
Section_____

C (5) Operate all cabin temperature selectors to full cool. Select No. 2 and No. 3
C pack hot air valves and manifold isolation valves to open.

C (a) Select FLT STA control valve to open. Operate FLT STA temp selector to
C full warm. Does FLT STA duct temp increase? * Yes_____No_____
C Operate FLT STA temp selector to full cool. Does FLT STA duct temp
C decrease? * Yes_____ No_____

C (b) Select FWD CAB control valve to open. Operate FWD CAB temp selector to
C full warm. Does FWD CAB duct temp increase? * Yes_____No_____
C Operate FWD CAB temp selector to full cool. Does FWD CAB duct temp
C decrease? * Yes_____No_____

C (c) Select MID CAB control valve to open. Operate MID CAB temp selector to
C full warm. Does MID CAB duct temp increase? * Yes_____No_____
C Operate MID CAB temp selector to full cool. Does MID CAB duct temp
C decrease? * Yes_____ No_____

C (d) Select AFT CAB control valve to open. Operate AFT CAB temp selector to
C full warm. Does AFT CAB duct temp increase? * Yes_____ No_____
C Operate AFT CAB temp selector to full cool. Does AFT CAB duct temp
C decrease? * Yes_____ No_____

C (e) Select Galley control valve to open. Operate Galley temp selector to
C full warm. Does Galley duct temp increase? * Yes_____ No_____
C Operate Galley temp selector to full cool. Does Galley duct temp
C decrease? * Yes_____No_____

C (f) Comments_____

_____

C (6) The next steps check the No. 1 pack fail remote relay circuit.

CR NOTE: Select humidity control OFF.

CR (a) Select all zone temp selectors to full warm.
CR NOTE: Allow 60 seconds for system response and stabilization.

CR (b) Do all TBV indicators move toward the warm position:
CR No. 1 * Yes_____No_____ No. 2 * Yes_____ No_____
CR No. 3 * Yes_____No_____

M1-0000-21-2194

Plane_____
Date_____
Station_____

C (6) (Continued)

CR (c) Select the FLT STA ZONE TEMP selector to full cool.

CR (d) Does the No. 1 TBV indicator move towards the cool position?
CR No. 1 * Yes_____ No_____ No. 2 Yes_____ * No_____
CR No. 3 Yes_____ No_____

CR (e) Select No. 1 pack flow control valve to close.
CR Flow Bar On_____ * OFF_____
CR NOTE: Failure of this step will fail the next step.

CR (f) Does the No. 2 TBV indicator move toward the cool position?
CR No. 2 * Yes_____ No_____ No. 3 Yes_____ * No_____

CR (g) Return all zone temp selectors to the center (12 o'clock) position.

CR (7) Check operation of FLT STA flow control valve with manual control handle
CR located under Flight Engineer desk. Verify the FLT STA airflow is reduced when
CR the knob is pulled and the flow increases when control knob is pushed in.

C PART II COMPLETED, CONTINUE TO PART III

C C. Part III Hot Manifold Check

C (1) Select No. 2 and No. 3 hot air and manifold isolation valves to close.

C (2) Select all cabin temperature selectors to full warm and all temperature
C control valves to close.

C (3) Select No. 3 pack flow control valve to off.
C NOTE: No. 2 pack should be the only system operating at this time.
C Allow 2 minutes for parameters to stabilize before continuing.

C (4) Select No. 2 hot air valve to open. Flow bar * On_____Off_____

C (5) Select No. 2 hot manifold isolation valve to open. Flow bar * On_____
C Off_____

C (6) Select all temperature control valves to open.

M1-0000-21-2195

Plane_____
Date_____
Station_____

C (7) Record:

C No. 2 hot manifold temperature_____°C Highest

C _____°C Stabilized

CR NOTE: Stabilized temperature should be 112° ±16°C.

C (8) Select No. 2 pack control valve off. Pack flow bar out? * Yes_____No_____

C No. 2 hot manifold isolation flow bar out? * Yes_____No_____

C (9) Select No. 2 hot air and manifold isolation valves to off.

C (10) Select all temp control valves to close.

C (11) Comments_____

_____

C (12) Select No. 3 pack flow control valve to open.

C NOTE: No. 3 pack should be the only system operating at this time.

C Allow 2 minutes for parameters to stabilize before continuing.

C (13) Select No. 3 hot air valve to open. Flow Bar * On_____Off_____

C (14) Select No. 3 manifold isolation valve to open. Flow Bar * On_____Off_____

C (15) Select all temp control valves to open.

C (16) Record:

C No. 3 hot manifold temperature_____°C Highest

C _____°C Stabilized

CR NOTE: Stabilized temperature should be 112° ±16°C.

CR (17) Deleted.

C (18) Select No. 3 pack flow control valve off. Pack flow bar out?

C No. 3 hot manifold bar out? * Yes_____No_____

C No. 3 manifold isolation flow bar out? * Yes_____No_____

C (19) Comments_____

_____

M1-0000-21-2196

Plane_____
Date_____
Station_____

C (20) Select all cabin temperature selectors to mid-range.

C (21) Select APU to min mode.

C (22) Secure air supply valves and APU as required.

ECS CHECK COMPLETED

C NOTE: Valves which are difficult or slow to operate may be caused by a
C plugged filter.

CR 1 – Pack flow valve for TWA Stk Nbr 80-0499 for actuator;
CR 89-6063 for flow sense.

C 2 – Hot manifold temperature control valve TWA Stk Nbr 80-0499.

C 3 – Hot manifold isolation valve TWA Stk Nbr 73-5393.

C 4 – Zone time pressure regulator valve TWA Stk Nbr 80-0499.

M1-0000-21-2197

SUPPLY DUCT SUPPORT STRUT - ADJUSTMENT AND TEST

1. General

Supply duct support struts are used in the right ECS compartment to maintain necessary clearance between adjacent ducts. These struts can be used either to pull or push the duct to create necessary duct clearance.

2. Adjustment/Test

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

A. Adjustment

(1) Open right ECS compartment access door 118 CR.

(2) Locate a strut holding duct requiring adjustment and disconnect strut either from the duct side or from the aircraft structure side (Ref. Fig. 501).

R CAUTION: DO NOT ADJUST STRUT LENGTH WITHOUT DISCONNECTING THE STRUT FROM ONE END.

(3) Make the necessary adjustment in strut length.

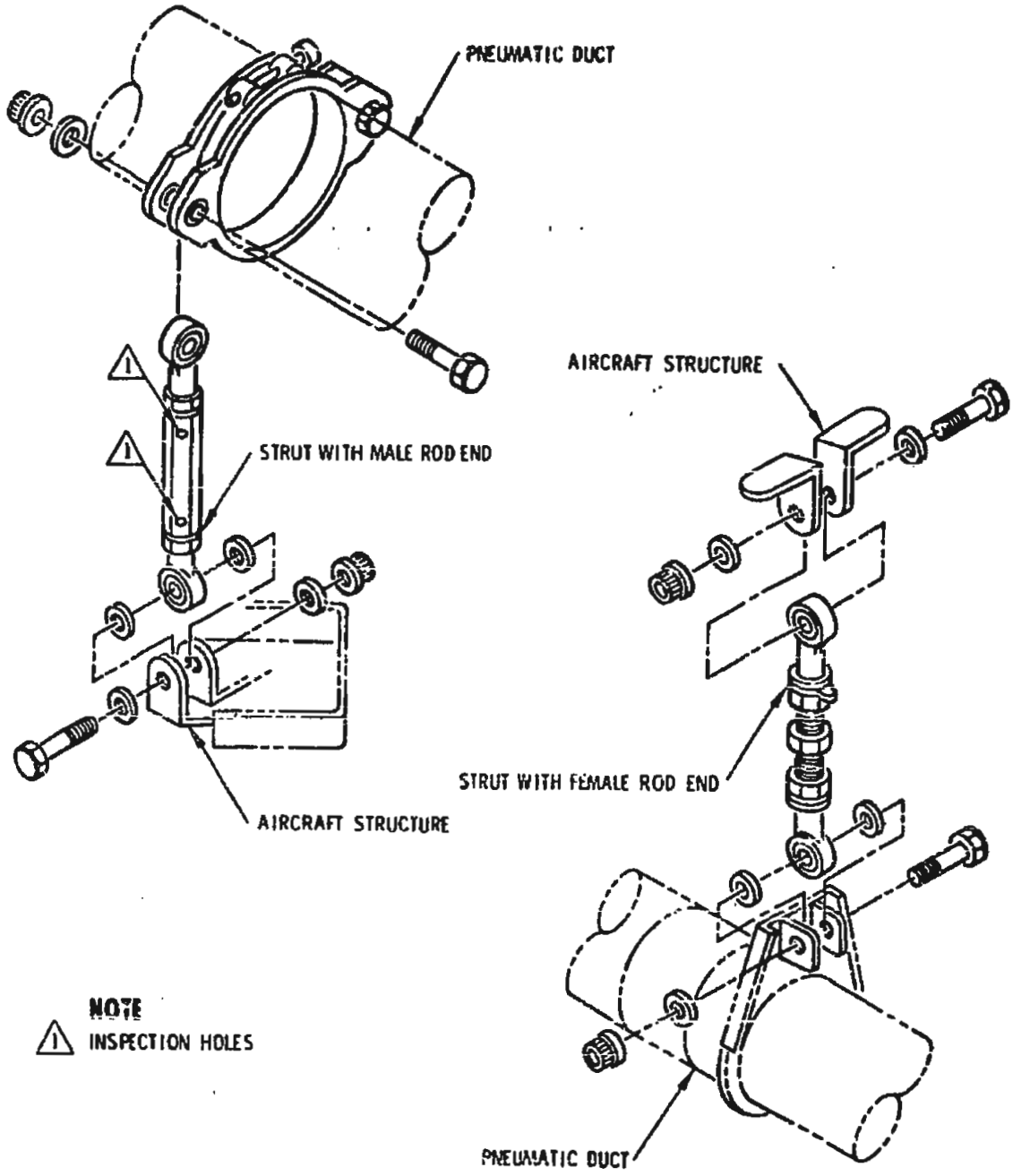
R CAUTION: WHEN ADJUSTING STRUT WITH MALE END, MAKE SURE THAT BOTH INSPECTION HOLES STAY BLOCKED.

(4) Push or pull the duct to get necessary clearance between the ducts and while holding the duct in this position, install strut end disconnected in Step 2A(2).

(5) Check for necessary duct clearance and if necessary repeat Steps 2A(2) thru 2A(5), till the necessary clearance between the ducts is attained.

(6) Remove WARNING tags installed in Step 2.

(7) Close ECS compartment access door.



MI-0100-21-062

R Pneumatic Duct Support Strut - Adjustment and Test
R Figure 501

COMPRESSION - DESCRIPTION AND OPERATION

1. General

Compressed air for air conditioning is supplied by the pneumatic system (Ref. 36-00-00). This air is taken from the pneumatic crossbleed manifold under the front spar of the wing center section, zone 142, through the three air cycle pack flow control valves (Ref. 21-21-00).

Air in the pneumatic system is provided by:

A. Engine Bleed Air Systems

Each engine normally supplies 122 pounds per minute (ppm) of air at cruise power, 180 ppm at takeoff, and 150 ppm at ground idle (Ref. 36-11-00).

B. Auxiliary Power Unit (APU) Load Compressor

The APU supplies up to 420 ppm of air and can operate the entire air conditioning system at rated capacity. The APU is intended primarily for on-ground use but may be used for inflight air conditioning to limited altitudes (Ref. 36-12-00).

C. High-pressure Ground Air Sources

Three standard high-pressure ground air connections on the manifold allow use of up to three ground air sources. Units delivering a total flow up to 450 ppm airflow may be used for maximum system operation. Partial system operation is available using lower output sources (Ref. 36-13-00).

The pneumatic distribution manifold system connects the pressure sources to the using systems (Ref. 36-14-00). The using systems
R include the engine start, wing anti-ice, air conditioning, and hydraulic systems (for two air turbine motor-driven hydraulic pumps) (Ref. Fig. 1 and 2).

R On aircraft 001-031 without SB30-043,
R an upper VHF antenna anti-ice system also uses pneumatic
R pressure sources.

The distribution manifold includes three duct isolation valves (two crossbleed and one aft fuselage) to control routing and use of compressed air from any source. The two crossbleed valves are installed in the fuselage crossbleed duct, one on each side about 12 inches from the centerline. The aft fuselage valve is in the aft lower left corner of the hydraulic service center.

All three valves are solenoid-controlled, and pneumatically actuated, through switchlights on the ENGINE BLEED CONTROL panel on the Flight Engineer/Second Officers upper panel (Ref. Fig. 3). The switchlights combine push-on/push-off switches with indicator lights.

2. Operation

Switchlight control of the three duct isolation valves, and the indications of valve action, are the same for all three valves. When a switchlight is depressed (latched in), the valve solenoid is energized and, if pneumatic pressure is available, the valve opens and the flowbar in the switchlight comes on. When the switchlight is released (out), the solenoid is deenergized to close the valve, and the OFF legend comes on. When the valve closes, the flowbar goes out.

WARNING: BEFORE THE AIR CONDITIONING SYSTEM IS OPERATED, ALL PROCEDURES, CAUTIONS, AND WARNINGS DETAILED IN THE PRESSURIZATION CONTROL SYSTEM SECTION OF THIS CHAPTER MUST BE UNDERSTOOD AND APPLIED (REF. 21-30-00).

A. High-pressure Ground Air Sources

The capacity (flow and pressure) of the high-pressure ground air sources in use determines how many of the three air cycle packs can be used. For normal operation each air cycle pack requires a 120-ppm airflow. Pressure requirements depend upon how much cooling is in use. On a hot day, 40 psia is required (no cabin pressurization). Maximum airflow through each air cycle pack flow control valve is automatically limited to 150 ppm at 50 psia (Ref. 21-21-00).

(1) Three ground air connections in use:

For maximum system use (all three air cycle packs in use) a high-pressure ground air sources supplying a minimum of 360 ppm is required. The system accepts a maximum of 450 ppm. With such a flow quantity available, normal system operation is as follows:

Close the three duct isolation valves by releasing the left CROSS BLEED, aft fuselage ISLN VALVE, and right CROSS BLEED switchlights. Each ground air connection is directed to one air cycle pack. As each PACK FLOW CONTROL switchlight is depressed (Ref. 21-21-00) to open a valve, airflow to the pack illuminates the flowbar in that switchlight.

(2) Two ground air connections in use:

With sufficient ground air source capacity (360 ppm) any two ground air connections may be used to operate all three air cycle packs. To open the valves (flowbar on), the left and right CROSS BLEED switchlights must be depressed to allow the three packs to share incoming air.

With lower ground air source capacity (240 to 300 ppm), only two air cycle packs may be used. Depending upon which ground air connections are in use, the left or right crossbleed valves must be opened or closed (as necessary) to direct the compressed air to the two air cycle packs in use.

(3) One ground air connection in use:

With sufficient ground air source capacity (240 to 300 ppm), one ground air connection may be used to operate two air cycle packs. Any two packs may be used, from any ground air connection, by selective positioning of the two CROSS BLEED and three PACK FLOW CONTROL switchlights and valves.

When ground air source capacity can only operate one air cycle pack (120 to 150 ppm), both crossbleed duct isolation valves should be closed and the ground air source should be connected directly to the air cycle pack which is to be used.

B. APU Load Compressor Air

When the APU is operating (Ref. 49-00-00), the load compressor delivers sufficient airflow (380-420 ppm) to operate all three air cycle packs. Air from the compressor is admitted into the pneumatic distribution system by depressing (latched in) the BLEED AIR S/O switchlight on the APU control panel, on the Flight Engineer/Second Officers upper instrument panel, to open the APU duct isolation valve (OPEN legend on).

Air from the duct isolation valve is admitted into the crossbleed manifold when the aft fuselage ISLN VALVE switchlight is depressed to open that valve (flowbar on). By depressing the left and right CROSS BLEED switchlights, those two valves are opened (flowbars on) to direct compressor air to all three air cycle pack flow control valves.

C. Engine Bleed Air

When the main engines are operating, each engine can supply enough bleed air to the pneumatic distribution system to

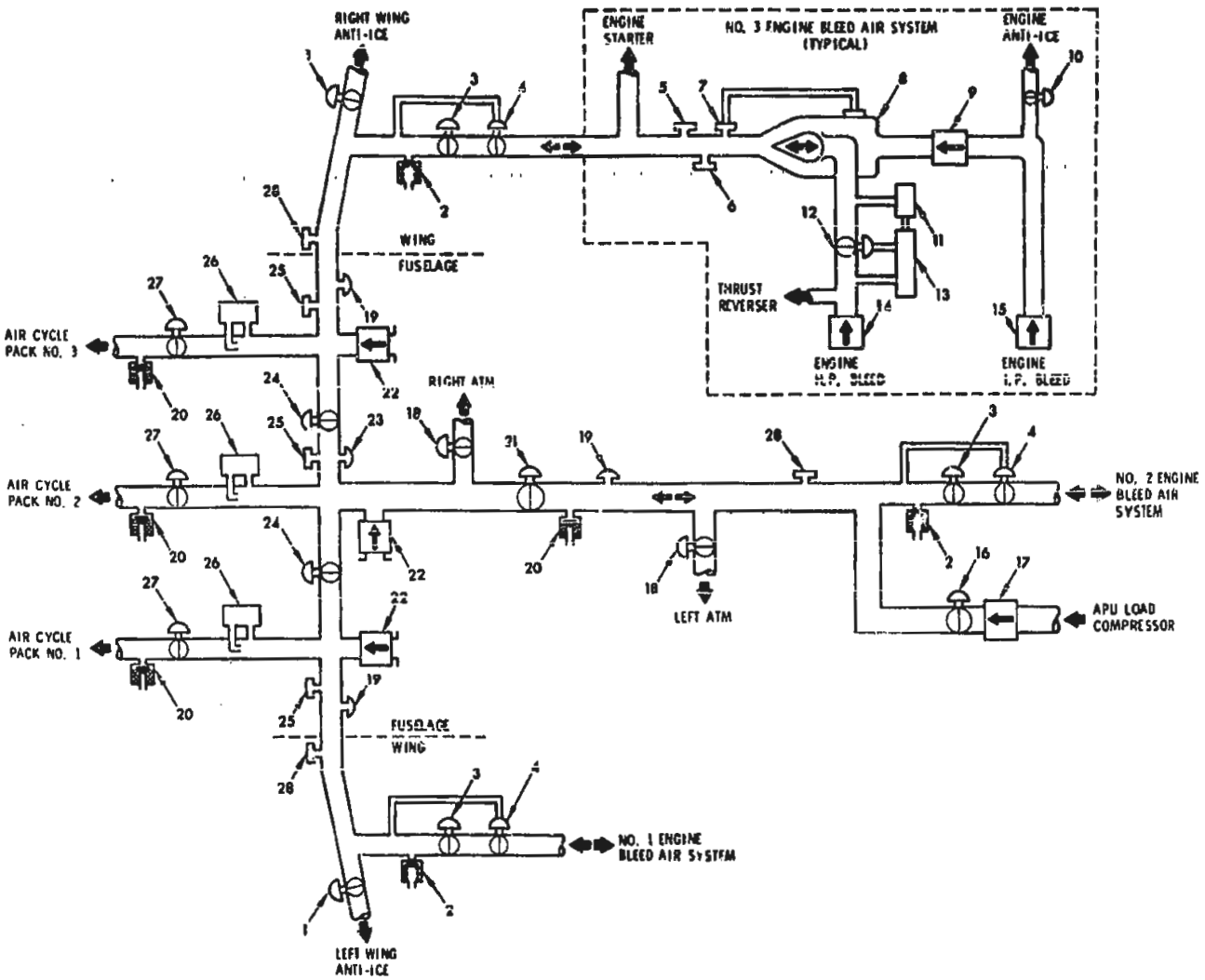
operate one air cycle pack. Flow quantity, pressure, and temperature are controlled as described in Chapter 36 (Ref. 36-11-00).

Engine bleed air is admitted into the pneumatic distribution manifold system when the three ENG ISO VALVE and the aft fuselage ISLN VALVE switchlights are depressed to open the valves (flowbars on) (Ref. Fig. 1, 2, and 3).

Operational procedure is to release the left and right CROSS BLEED switchlights to close those valves (OFF legend on) so each engine bleed air system is connected to its respective air cycle pack. The system may also be operated with the crossbleed valves open at the option of the operator. If an air cycle pack malfunctions, the pack flow control valve for that pack is automatically closed.

If an engine malfunctions use of the corresponding air cycle pack is terminated, and the pack flow control valve is closed.

If both an air cycle pack and an engine malfunction, remaining bleed air can be directed to the operational air cycle packs by selective positioning of the crossbleed duct isolation valves and the pack flow control valves.



1 ANTI-ICE REGULATING/SHUTOFF VALVE (30-13-00)
2 OVERPRESSURE RELIEF VALVE (36-11-00)
3 OVERPRESSURE SHUTOFF VALVE (36-11-00)
4 ENGINE ISOLATION VALVE (36-11-00)
5 TEMPERATURE SEQUENCE SWITCH (36-11-00)
6 OVERTEMPERATURE SWITCH (36-11-00)
7 MIXING EJECTOR TEMPERATURE SENSOR (36-11-00)
8 MIXING EJECTOR (36-11-00)
9 I.P. ANTI-ICE CHECK VALVE (36-11-00)
10 ANTI-ICE REGULATING/SHUTOFF VALVE (30-21-00)
11 HIGH-PRESSURE VALVE CONTROLLER (36-11-00)
12 HIGH-PRESSURE VALVE (36-11-00)
13 HIGH-PRESSURE OVERPRESSURE SWITCH (36-11-00)
14 HIGH-PRESSURE CHECK VALVE (75-00-00)
15 INTERMEDIATE PRESSURE CHECK VALVE (75-00-00)
16 APU DISCHARGE DUCT ISOLATION VALVE (36-12-00)
17 APU DISCHARGE CHECK VALVE (49-51-00)
18 ATM CONTROL VALVE (29-11-00)
19 PRESSURE TRANSMITTER (36-21-00)
20 CONDENSATE DRAIN VALVE (36-14-00)
21 AFT FUSELAGE DUCT ISOLATION VALVE (36-14-00)
22 HIGH PRESSURE GROUND AIR CONNECTION AND CHECK VALVE (36-13-00)
23 ATM PRIORITY PRESSURE SENSOR (21-21-00)
24 CROSSBLEED DUCT ISOLATION VALVE (36-14-00)
25 PACK INLET TEMPERATURE SENSOR (21-63-00)
26 HIGH FLOW SENSOR (AIR DIFFERENTIAL PRESSURE SWITCH, REF. 36-14-00)
27 PACK FLOW CONTROL VALVE (21-21-00)
28 AIDS TEMPERATURE SENSOR (36-11-00)

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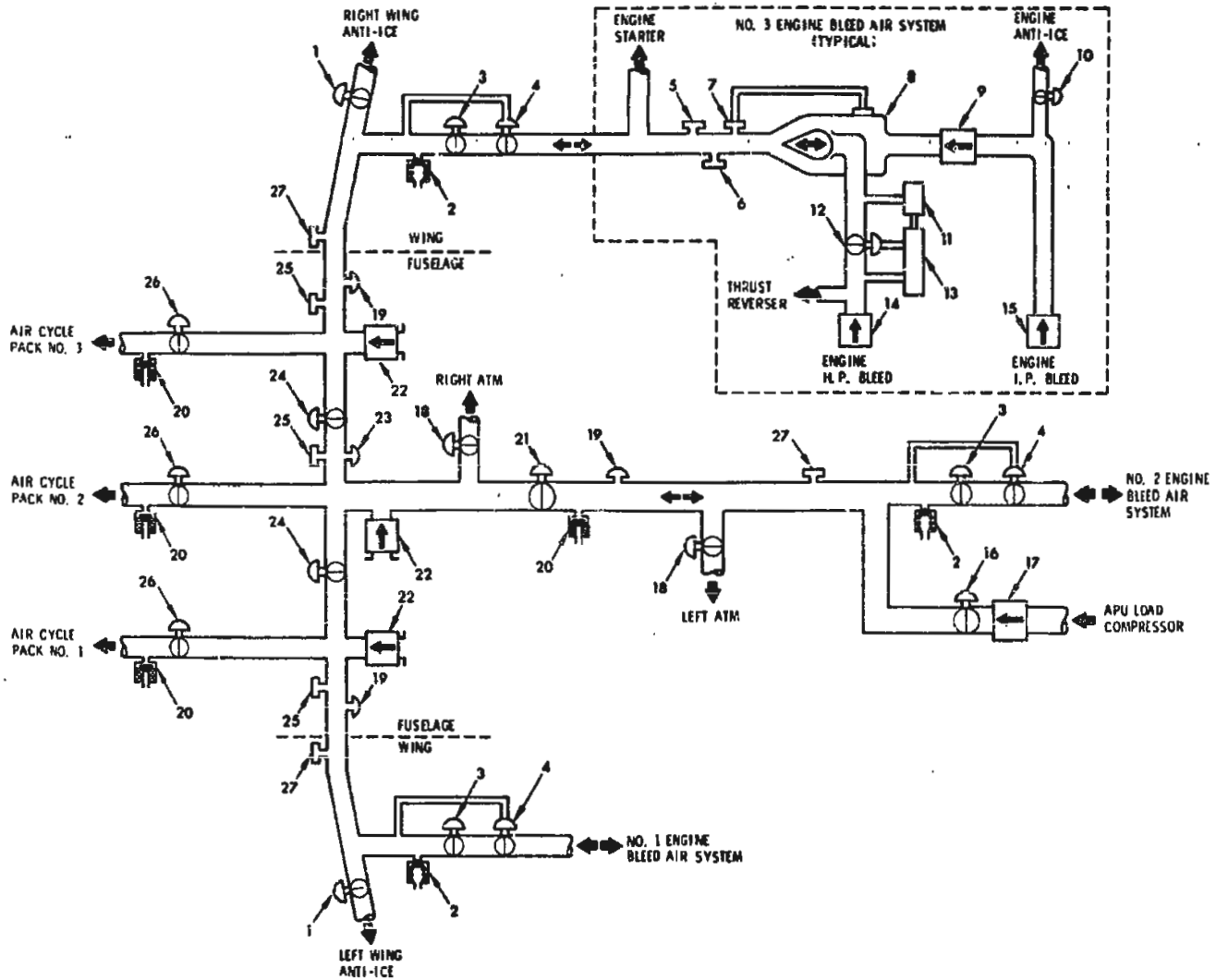
R Pneumatic Distribution System Schematic
R Figure 1

EFFECTIVITY: 001-033 WITHOUT SB21-184

001B



1 ANTI-ICE REGULATING/SHUTOFF VALVE (30-13-00)
2 OVERPRESSURE RELIEF VALVE (36-11-00)
3 OVERPRESSURE SHUTOFF VALVE (36-11-00)
4 ENGINE ISOLATION VALVE (36-11-00)
5 TEMPERATURE SEQUENCE SWITCH (36-11-00)
6 OVERTEMPERATURE SWITCH (36-11-00)
7 MIXING EJECTOR TEMPERATURE SENSOR (36-11-00)
8 MIXING EJECTOR (36-11-00)
9 I.P. ANTI-ICE CHECK VALVE (36-11-00)
10 ANTI-ICE REGULATING/SHUTOFF VALVE (30-21-00)
11 HIGH-PRESSURE VALVE CONTROLLER (36-11-00)
12 HIGH-PRESSURE VALVE (36-11-00)
13 HIGH-PRESSURE OVERPRESSURE SWITCH (36-11-00)
14 HIGH-PRESSURE CHECK VALVE (75-00-00)
15 INTERMEDIATE PRESSURE CHECK VALVE (75-00-00)
16 APU DISCHARGE DUCT ISOLATION VALVE (36-12-00)
17 APU DISCHARGE CHECK VALVE (49-51-00)
18 ATM CONTROL VALVE (29-11-00)
19 PRESSURE TRANSMITTER (36-21-00)
20 CONDENSATE DRAIN VALVE (36-14-00)
21 AFT FUSELAGE DUCT ISOLATION VALVE (36-14-00)
22 HIGH PRESSURE GROUND AIR CONNECTION AND CHECK VALVE (36-13-00)
23 ATM PRIORITY PRESSURE SENSOR (21-21-00)
24 CROSSBLEED DUCT ISOLATION VALVE (36-14-00)
25 PACK INLET TEMPERATURE SENSOR (21-63-00)
26 PACK FLOW CONTROL VALVE (21-21-00)
27 AIDS TEMPERATURE SENSOR (36-11-00)

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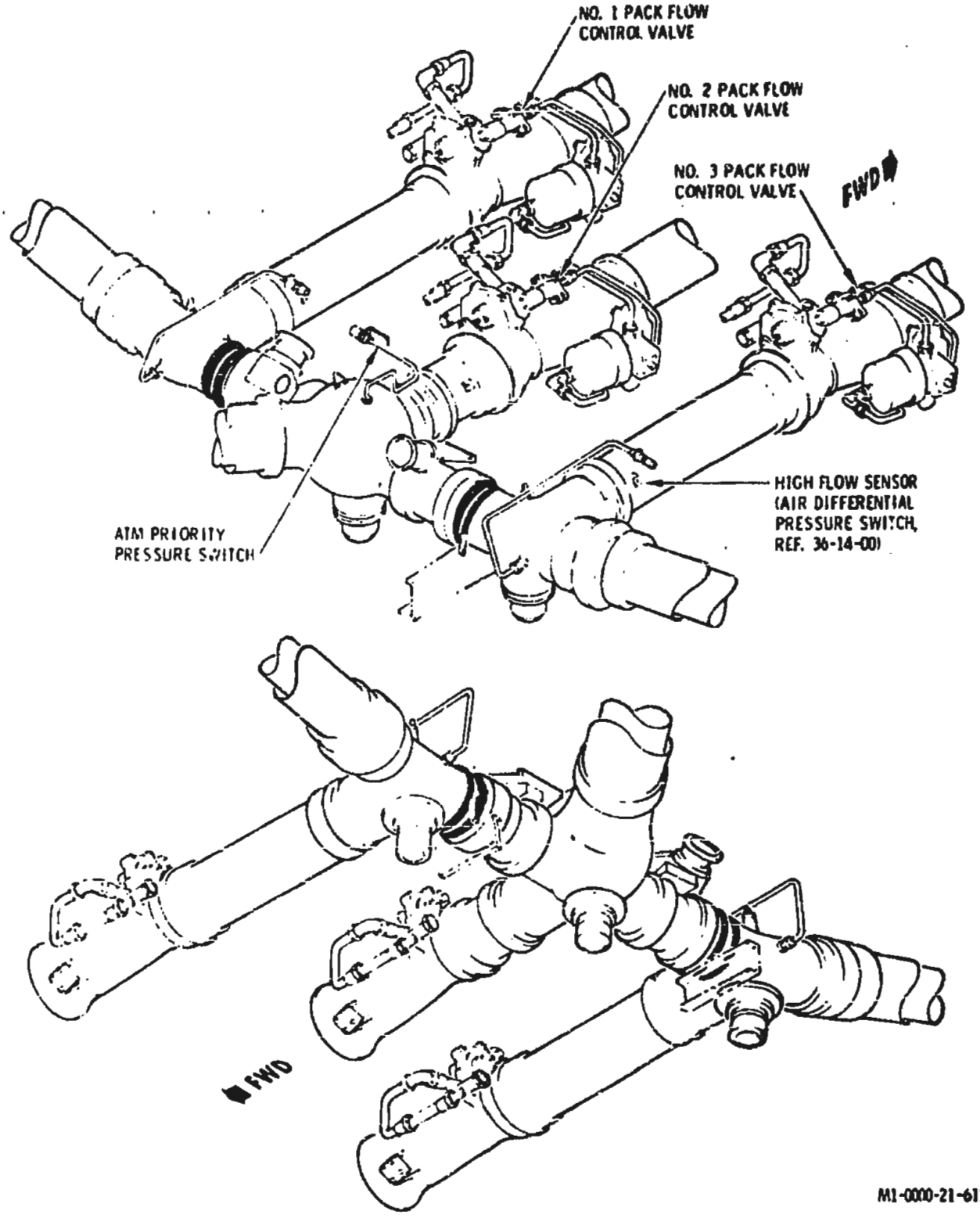
R R Pneumatic Distribution System SHEMATIC
Figure 1

R R EFFECTIVITY: 001-033 WITH S621=184 AND 034-036

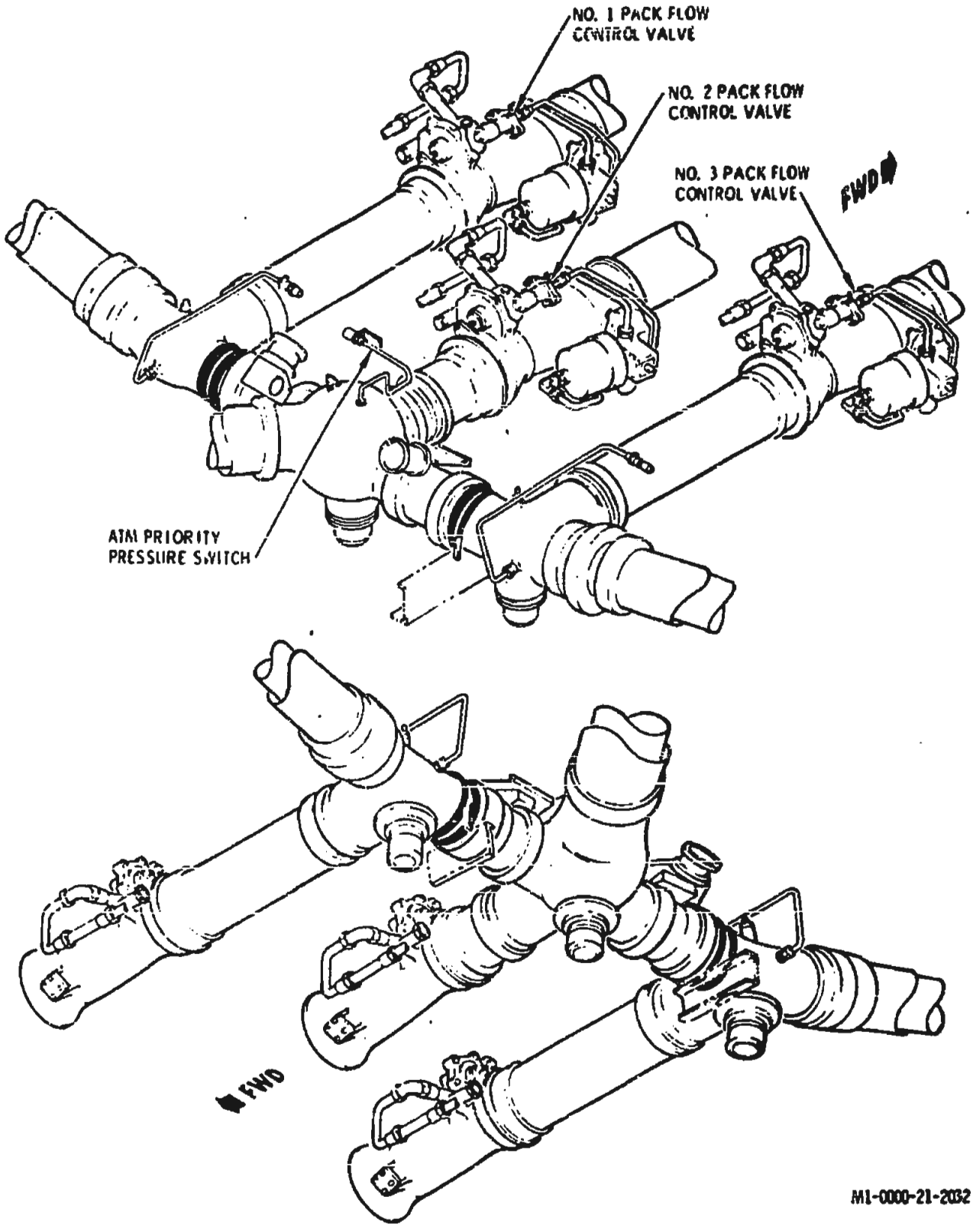
001B


NO. 1 PACK FLOW CONTROL VALVE
NO. 2 PACK FLOW CONTROL VALVE
NO. 3 PACK FLOW CONTROL VALVE
FWD
HIGH FLOW SENSOR (AIR DIFFERENTIAL PRESSURE SWITCH, REF. 36-14-00)
ATM PRIORITY PRESSURE SWITCH
FWD
M1-0000-21-615

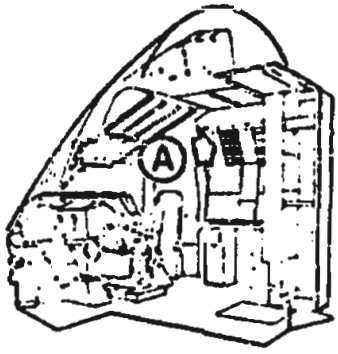
R R Pneumatic Crossbleed Manifold
Figure 2

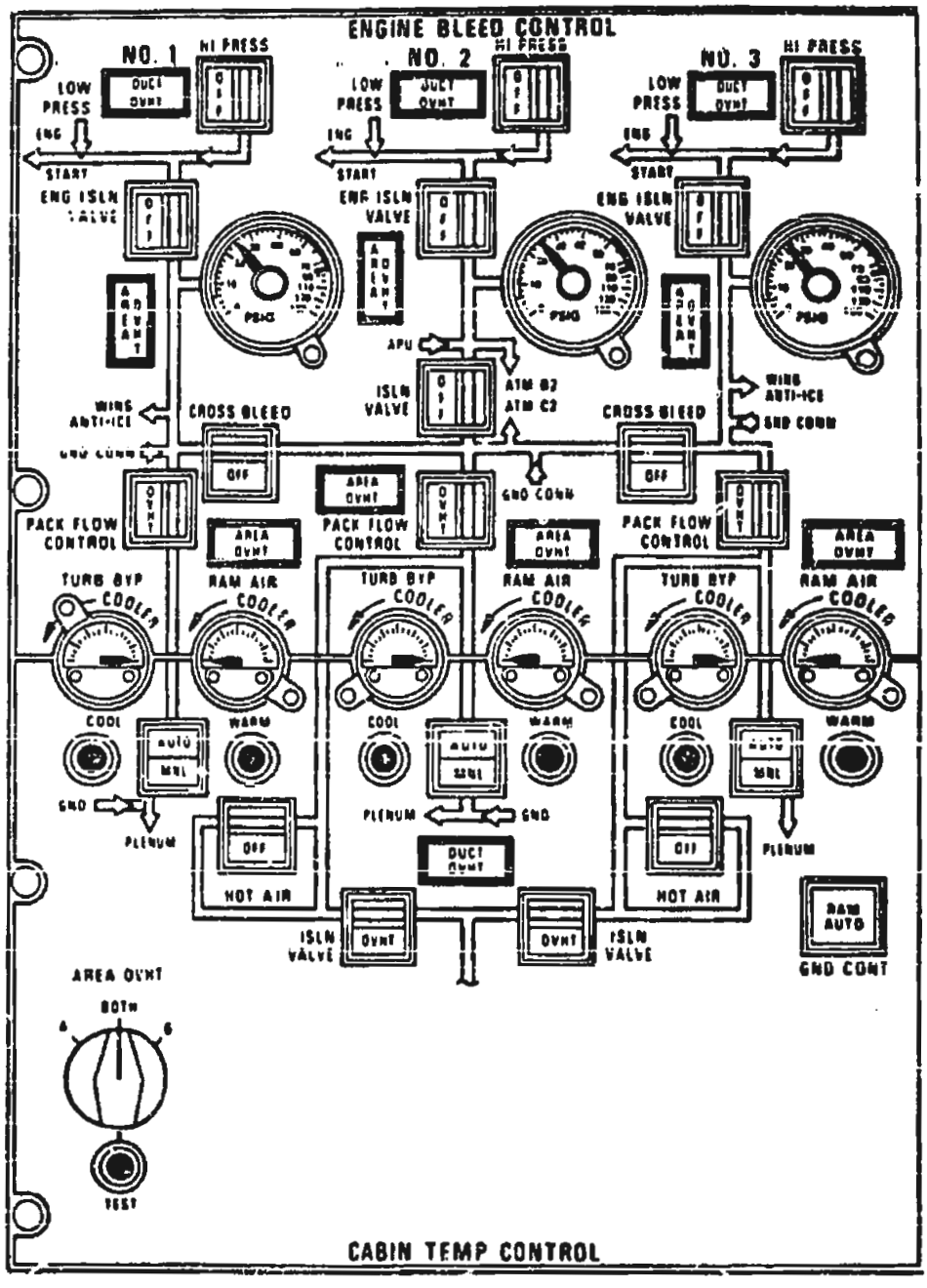
R R EFFECTIVITY: 001-033 WITHOUT SB21-184

001 6



R R Pneumatic Crossbleed Manifold
Figure 2





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Integrated Pneumatic System Control Panels
Figure 3

DISTRIBUTION - DESCRIPTION AND OPERATION

1. General

R The distribution system includes ducting and components used to
R deliver air to the flight station, forward, mid, and aft cabin,
R and the galley (except air cycle pack components), and the
R positive ventilation/exhaust systems for the galley, forward
R electronic, and mid electrical compartments.

The following is a description of the entire distribution system. For detailed descriptions of the subsystems of the distribution system see:

Supply System, 21-21-00

Flight Station System, 21-22-00

Cabin System, 21-23-00

Galley System, 21-24-00

Electrical and Electronic Service Centers, 21-25-00

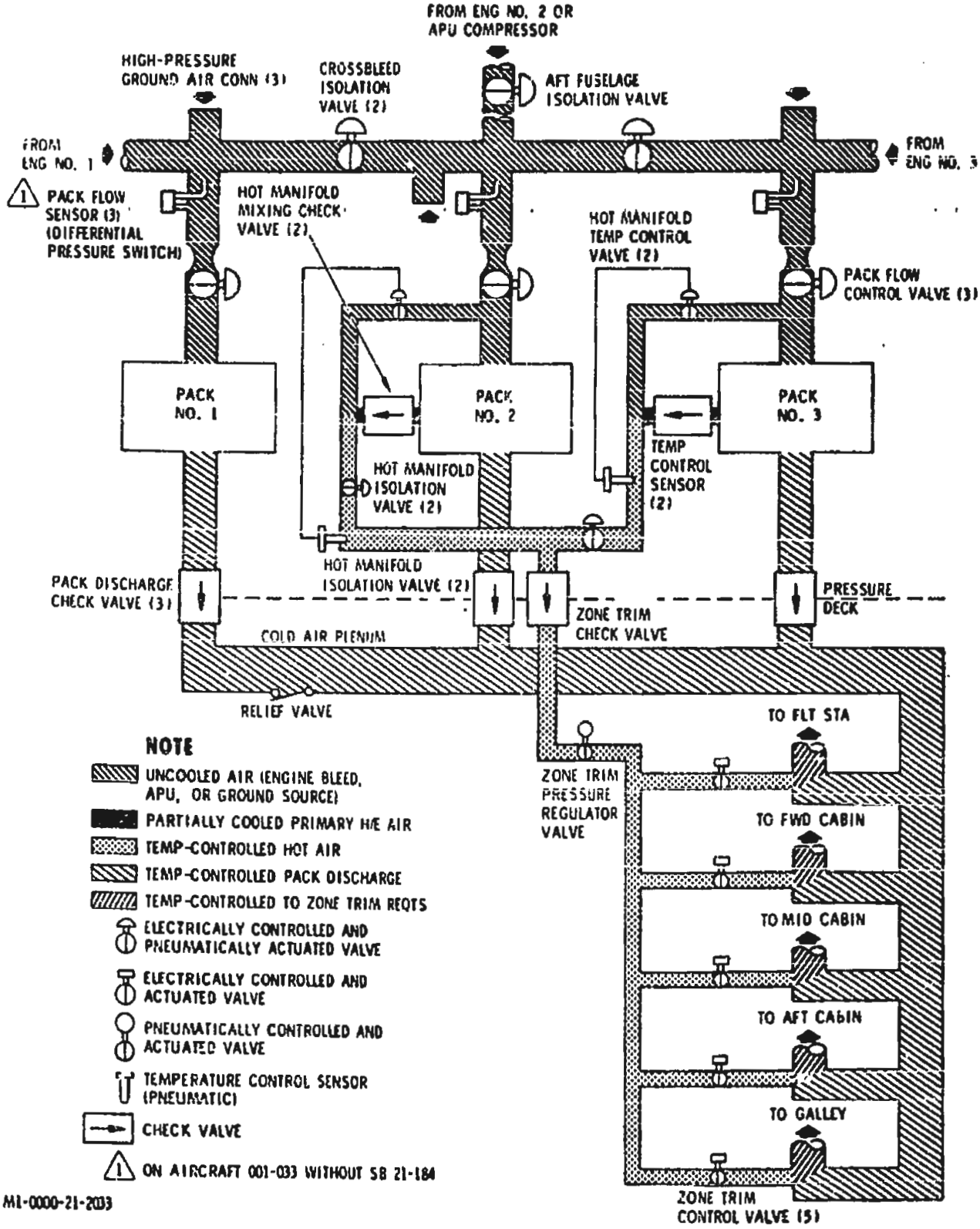
Lavatory System, 21-26-00

On aircraft 001-031 without SB30-043,
VHF Antenna Anti-Ice, 30-51-00

The high-pressure/high-temperature ducting (from the pneumatic system manifold through the air cycle packs to the pressure deck) is made of titanium. Low-pressure ducting exposed to hydraulic fluid is made of corrosion-resistant steel. Low-pressure/low-temperature ducting in pressurized areas is made of reinforced fiber glass. Low-pressure/high-temperature ducting, used in the hot air system, is made of aluminum alloy.

From the pneumatic system crossbleed manifold, located under the forward portion of the wing center section, air enters the air conditioning system through three air cycle pack flow control valves. Three ducts carry this air forward along the bottom of the fuselage to the environment control system (ECS) compartments on each side of the nose wheel well. The No. 1 air cycle cooling system (No. 1 pack) is on the left side, and the No. 2 and No. 3 packs are on the right (Ref. Fig. 1).

R The hot air manifold system (Ref. 21-41-00) provides controlled quantities of uncooled and partially cooled air from upstream and downstream of the primary heat exchanger in the No. 2 and No. 3 air cycle packs. This mixed air, controlled to 230


FROM ENG NO. 2 OR APU COMPRESSOR
HIGH-PRESSURE GROUND AIR CONN (3)
CROSSBLEED ISOLATION VALVE (2)
AFT FUSELAGE ISOLATION VALVE
FROM ENG NO. 1
FROM ENG NO. 3
1 PACK FLOW SENSOR (3) (DIFFERENTIAL PRESSURE SWITCH)
HOT MANIFOLD MIXING CHECK VALVE (2)
HOT MANIFOLD TEMP CONTROL VALVE (2)
PACK FLOW CONTROL VALVE (3)
PACK NO. 1
PACK NO. 2
PACK NO. 3
HOT MANIFOLD ISOLATION VALVE (2)
TEMP CONTROL SENSOR (2)
HOT MANIFOLD ISOLATION VALVE (2)
PACK DISCHARGE CHECK VALVE (3)
PRESSURE DECK
ZONE TRIM CHECK VALVE
COLD AIR PLENUM
RELIEF VALVE
TO FLT STA
ZONE TRIM PRESSURE REGULATOR VALVE
TO FWD CABIN
TO MID CABIN
TO AFT CABIN
TO GALLEY
ZONE TRIM CONTROL VALVE (5)
NOTE
UNCOOLED AIR (ENGINE BLEED, APU, OR GROUND SOURCE)
PARTIALLY COOLED PRIMARY H/E AIR
TEMP-CONTROLLED HOT AIR
TEMP-CONTROLLED PACK DISCHARGE
TEMP-CONTROLLED TO ZONE TRIM REQTS
ELECTRICALLY CONTROLLED AND PNEUMATICALLY ACTUATED VALVE
ELECTRICALLY CONTROLLED AND ACTUATED VALVE
PNEUMATICALLY CONTROLLED AND ACTUATED VALVE
TEMPERATURE CONTROL SENSOR (PNEUMATIC)
CHECK VALVE
1 ON AIRCRAFT 001-033 WITHOUT SB 21-184
MI-0000-21-2033

R R Air Conditioning System Simplified Schematic
Figure 1

degrees F (110 degrees C), enters the hot air manifold to be used by the zone trim temperature control system (Ref. 21-61-00).

Cooled discharge air from all three air cycle packs is ducted to a common cold air plenum. Air from this plenum, together with a controlled quantity of trim air from the hot air manifold, goes through individual ducting systems to the flight station, to each of three cabin zones, and to the galley.

R The temperature-controlled air enters the flight station through outlets in the overhead, side window lower sills, and through controllable individual air outlets at each of the five flight crew stations. Air from the flight station is exhausted into the forward electronic service center.

The cabin is divided into three zones (forward, mid, and aft) for temperature control purposes. Three ducting systems deliver fresh, temperature-controlled air to overhead ducts in each zone. From these overhead ducts, air enters the cabin through overhead discharge openings along the length of the ceiling and through controllable individual air outlets above each passenger seat.

The overhead discharge openings incorporate a jet pump action that picks up and recirculates air from near the ceiling. This feature minimizes visible moisture discharge and maintains optimum cabin air circulation with minimum drafts and temperature stratification.

Air leaves the cabin through floor-level exhaust openings along each side of the fuselage. From these openings the air flows beneath the floor into the cheek areas on each side of the cargo compartments. Part of the forward cabin air enters the forward electronic service center, the mid electrical service center, and the galley. Air from the cheek areas on each side of the forward cargo compartment flows beneath that compartment to exhaust overboard through the forward outflow valve. Air from the aft cabin is exhausted into the cheek areas on each side of the center and aft cargo compartments, flows beneath those compartments, and is exhausted through the aft outflow valve below the center cargo compartment.

R The underfloor galley air supply enters through four fixed outlets in the ceiling (around the light fixtures), and through two individual controllable air outlets in the aft portion of the galley (one on each side). Galley supply air is also used by the potable water system to pressurize the water tank (Ref. 38-41-00).

Galley exhaust air control is provided by a positive ventilation/exhaust system. Air from above the ovens is ducted

to a continuously operating fan and exhausted overboard through a flow-controlling exhaust valve.

To assure proper equipment and compartment cooling, positive ventilation/exhaust systems are also provided for the forward electronic service center (FESC) and the mid electrical service center (MESC). The FESC receives exhaust air from the flight station and forward cabin; and the MESC receives mid cabin exhaust air.

R On aircraft 001-020 without SB 21-050, air is taken from the bottom of the FESC by the instrument cooling system and delivered through ducting to discharge points behind the flight engineer/second officers panel and the pilots instrument panels.

R On aircraft 001-020 with SB21-050, and 021-999, flight station instrument cooling air is drawn in by flight station instrument cooling fan through a ducted inlet in Flight Engineer/Second Officer kickshield panel, and delivered through ducting to discharge points behind the Flight Engineer/Second Officer panel and the Pilots instrument panels.

In each compartment, a continuously operating exhaust fan draws air through equipment and area collector ducts. In flight, the FESC cooling air is ducted to the underfloor area of the forward cargo compartment and the MESC cooling air is ducted to the galley underfloor area. From these two underfloor areas, air is exhausted overboard through the forward outflow valve.

If a compartment fan fails in flight, a mass flow control valve in the affected compartment ducting system automatically opens to exhaust the cooling air directly overboard.

For on-ground operation, the mass flow control valves are opened by the ground sensing circuits to exhaust the cooling air directly overboard.

Each forward and aft lavatory receives air directly from the forward and aft overhead cabin air ducts through individual air outlets. The lavatory exhaust systems scavenge air from each lavatory through the waste systems and exhausts it directly overboard through mass flow control valves. On the ground or during unpressurized flight, jet pumps using pneumatic system air pressure provide positive scavenge/exhaust airflow. An external air connection is also provided for jet pump operation on the ground if desired.

On aircraft 001-031 without SB30-043, air taken from the ducts upstream of the No. 2 and No. 3 heat exchangers is used to anti-ice the upper VHF antenna (Ref. 30-51-00).

2. Cooling Air Overboard Switchlight

A. Description and Operation

The COOL AIR OVBD switchlight on the Flight Engineer/Second Officer ECS MONITOR panel (Ref. 21-10-00, Fig. 3) controls the position of three flow control valves. One valve is in the galley exhaust duct, one is in the FESC, and one is in the MESC.

The switchlight is used as an override control to close the three valves to conserve cabin pressure when incoming supply air is less than normal.

When the COOL AIR OVBD switchlight is released (out) all three flow control valves close. Valve closure causes the exhaust air from the three compartments to be exhausted through the forward outflow valve.

When the switchlight is depressed (latched in) the galley valve opens (Ref. 21-24-00), and galley air is exhausted overboard. The other two valves will open only if the aircraft is on the ground (Ref. 21-25-00). If the aircraft is airborne and there is service center exhaust fan failure, the corresponding valve will open and the air from the compartment with the failed fan is exhausted overboard.

SUPPLY SYSTEM - DESCRIPTION AND OPERATION

1. General

The pack flow control system takes air from the pneumatic system (Ref. 36-00-00) and delivers it to the air cycle packs (Ref. 21-51-00) and the hot air manifold system (Ref. 21-41-00). The preconditioned ground air system delivers air to the cold air plenum. In addition to ducting, major components in the system are the three pack flow control valves, three duct compensators, two preconditioned ground air connections and associated check valves, and compressor and pack discharge overtemperature switches in each of the three air cycle packs (Ref. Fig. 1).

A. Pack Flow Control System

The three pack flow control valves (Ref. 21-21-01) are the entry points for air from the pneumatic system into the air conditioning system. These valves, installed below the floor of the mid electrical service center (zone 137), control flow of pneumatic system air to the three air cycle packs and the hot air manifold system.

The ducting from the three pack flow control valves to the air cycle packs on each side of the nose wheel well consists of three parallel duct systems running forward just above the bottom of the fuselage.

R A compensator is installed in each of the three duct systems under the aft portion of the forward cargo compartment.

A bleed air cleaner is installed in each of the three duct systems under the forward cargo compartment.

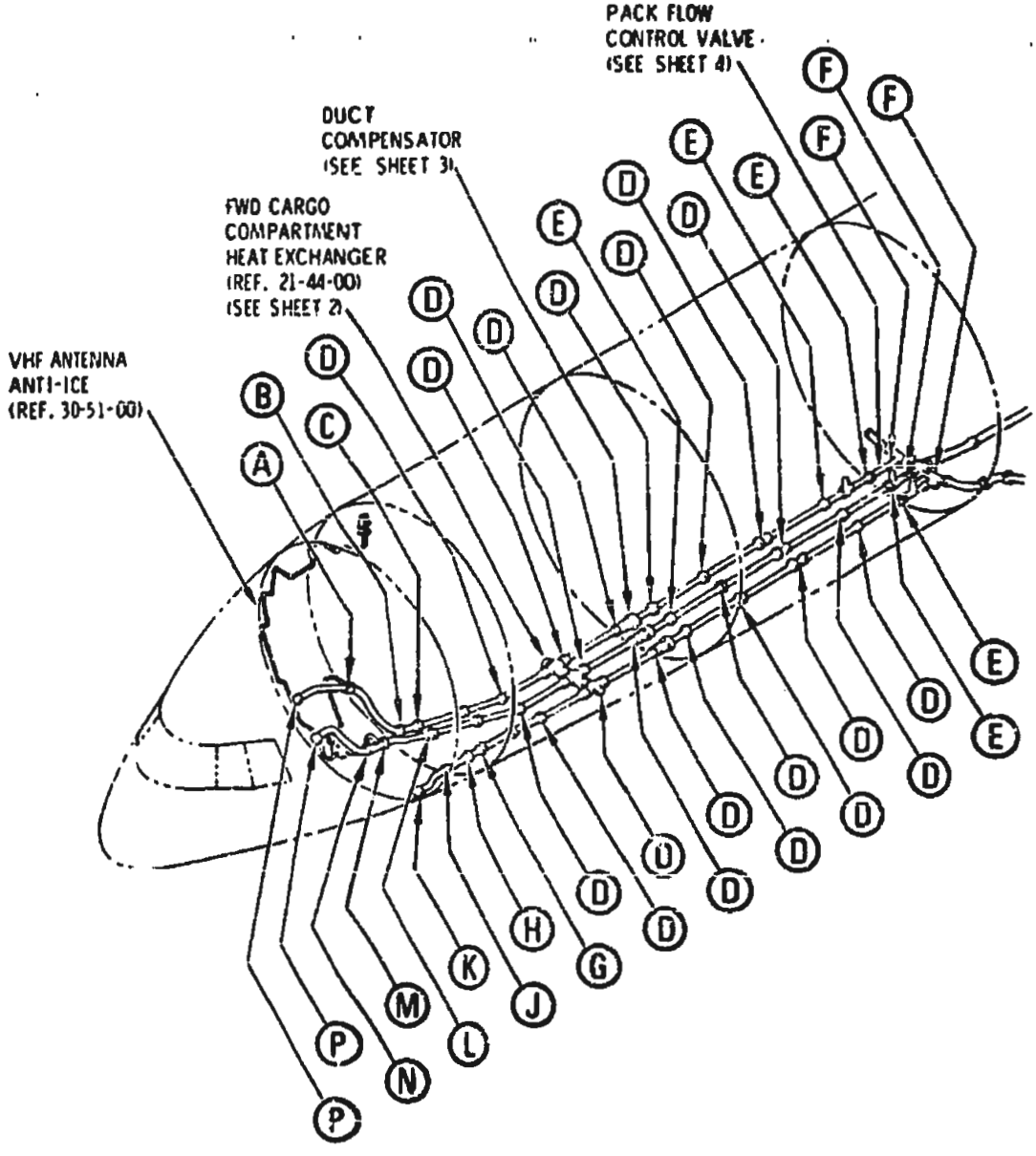
B. Preconditioned Ground Air System

Preconditioned air is delivered to the cold air plenum from an external ground supply. In addition to ducting, the major components in the system are two preconditioned ground air connections, and associated check valves. Temperature, flow rate and pressure are controlled by the ground equipment supplying the air.

2. Pack Flow Control System

A. Description

Each pack flow control valve controls air supply to one air cycle pack. When a valve closes, the corresponding pack



R
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Supply System Installation
Figure 1 (Sheet 1)

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EFFECTIVITY: WITHOUT SB30-043

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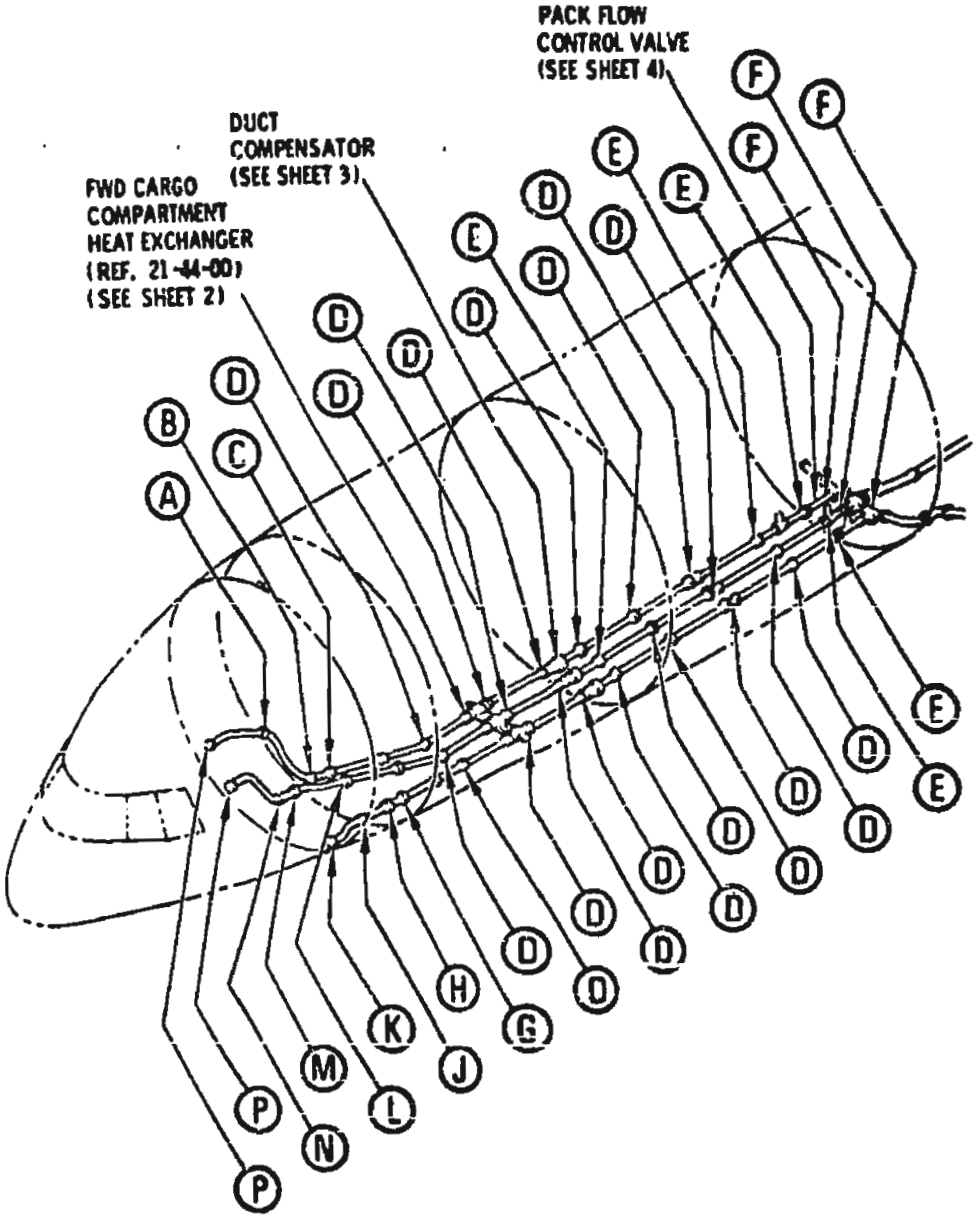

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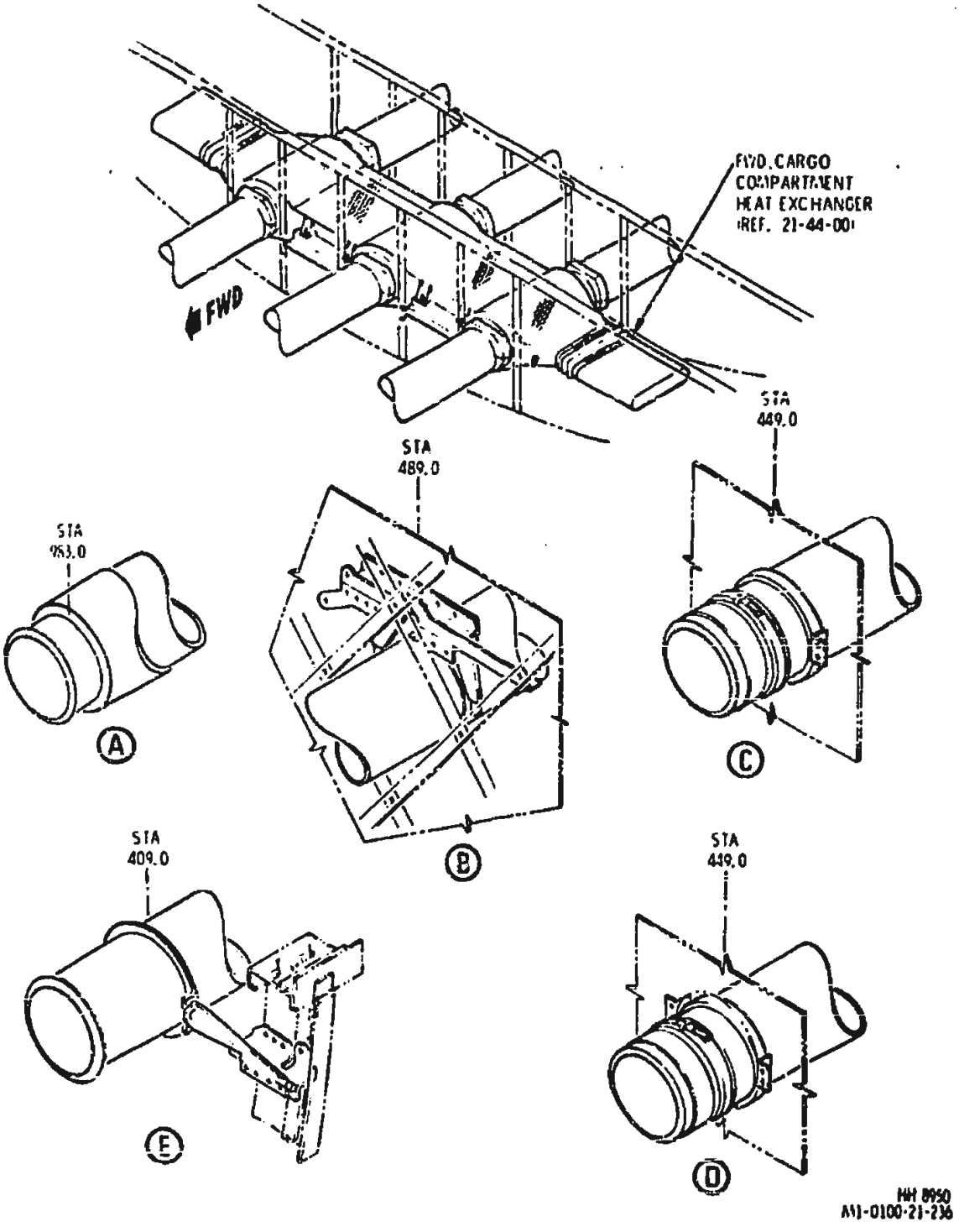
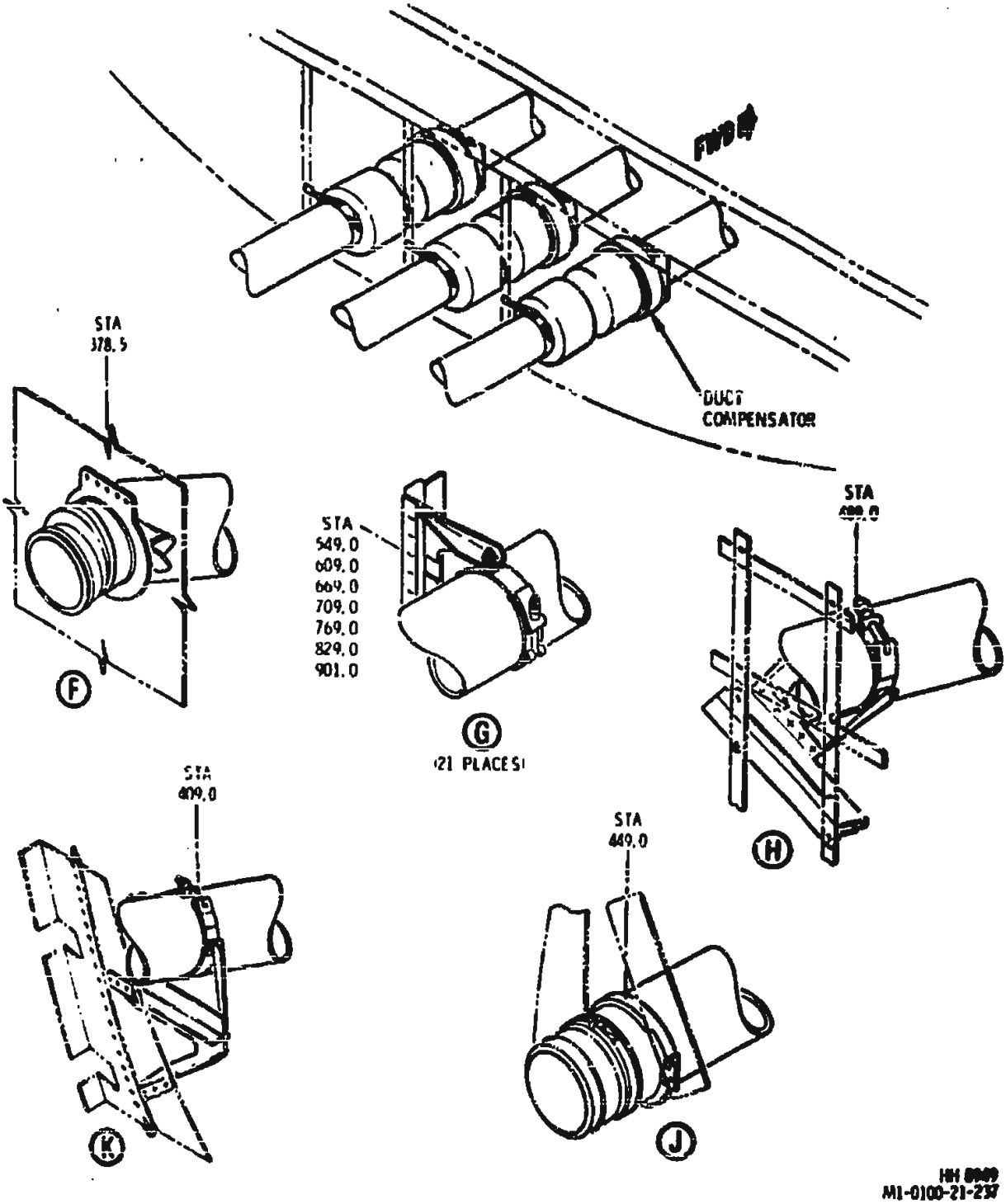
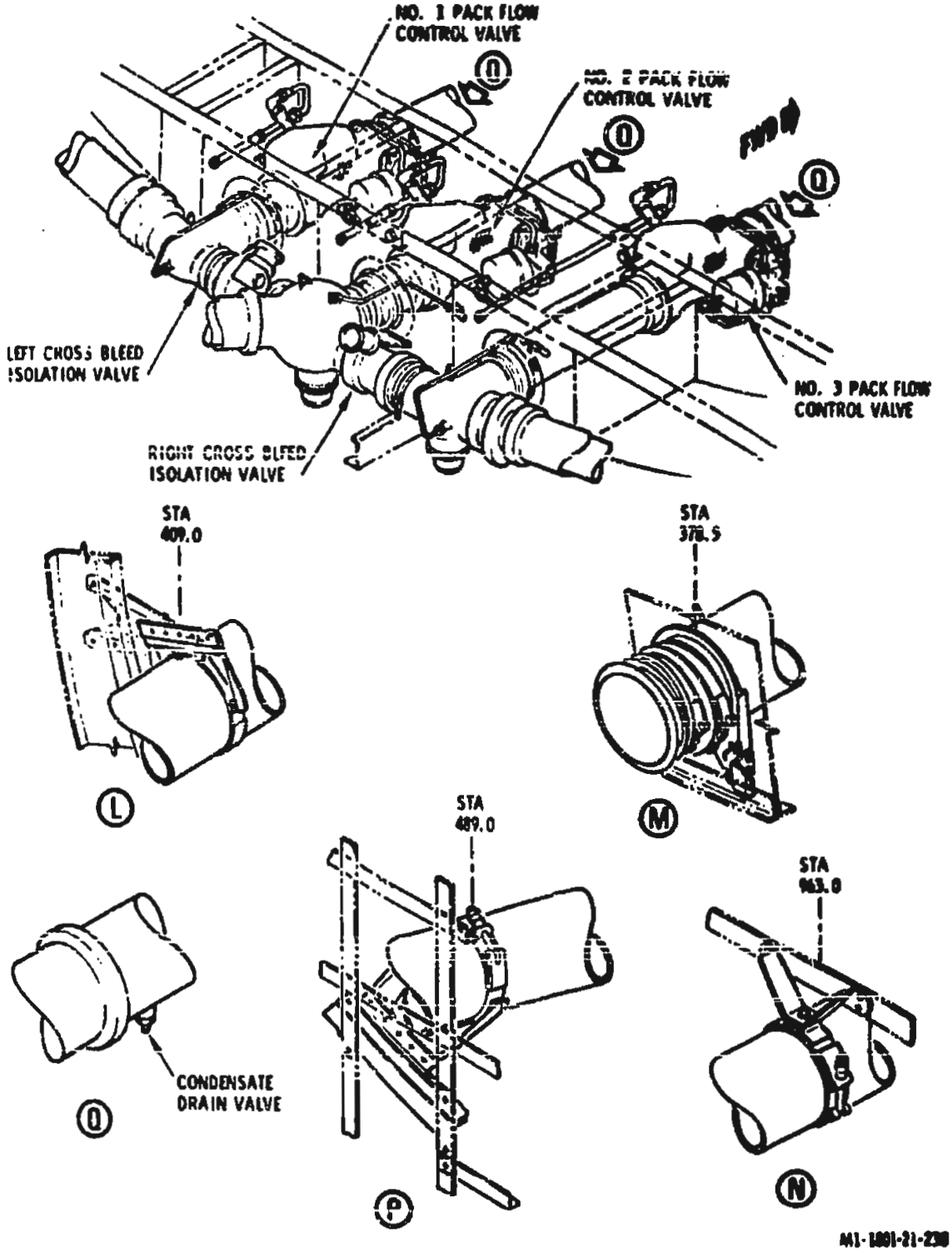
Supply System Installation
Figure 1 (Sheet 1)



Supply System Installation
Figure 1 (Sheet 2)



Supply System Installation
Figure 1 (Sheet 3)



Supply System Installation
Figure 1 (Sheet 4)

becomes inoperative. When open, the pack flow control valve controls both quantity and pressure of airflow to the using system. Three pack high flow sensors (air differential pressure switches) detect breaks in the ducts between the distribution manifold (Ref. 36-14-00) and the three pack flow control valves. If a duct breaks, flow sensor action closes the affected pack flow control valve and the appropriate crossbleed and fuselage isolation valves.

The duct compensators (Ref. 21-21-05) are telescoping duct assemblies whose function is to compensate for changes in the length of ducting in the system due to changes in temperature. When carrying duct air pressure, the duct compensator attempts to shorten (telescope). As other duct sections in the system change length with temperature changes, the duct compensator shortens or lengthens to maintain tension on the system ducting.

Three condensate drain valves are located in the main air supply ducts, just forward of the pack flow control valves. These valves are spring loaded in the open position and close when the duct pressure reaches one to four pounds per square inch. The valves are screwed into bosses on the lower sides of the ducts and drain directly into the bilge area. Fuselage drains in this area (Ref. 51-01-00) allow the water to drain overboard.

In each of the three air cycle packs a compressor overtemperature switch (Ref. 21-21-21) and a pack discharge overtemperature switch (Ref. 21-21-24) provide override control to protect individual air cycle pack systems from high temperatures by closing the pack flow control valve for that system.

The compressor overtemperature switches, mounted in the compressor discharge housing of each air cycle machine, are actuated when discharge air temperature exceeds 425° F (218° C). The pack discharge overtemperature switches, which are mounted in each of the three pack discharge ducts downstream of the water separator, are actuated when air temperature in the ducts exceeds 205° F (96° C). If the mid fuselage bleed air duct pressure drops to or below ATM priority pressure switch closing pressure the switch closes (Ref. Fig. 3).

B. Operation

The three identical pack flow control valves are electrically controlled and pneumatically actuated. During normal operation, opening and closing of each valve is controlled by one of the three PACK FLOW CONTROL switchlights on the Flight Engineer/ Second Officers ENGINE BLEED CONTROL panel (Ref. 21-10-00, Fig. 3). When the PACK

FLOW CONTROL switchlight is depressed (latched in), the pack flow control valve solenoid is deenergized and pneumatic pressure opens the valve to its flow controlling/pressure limiting position. When the valve opens the switchlight flowbar comes on. When the switchlight is released (out), the control solenoid is energized to vent the valve actuator pressure, the valve closes, and the flowbar goes out.

Normal control selections tc open the pack flow control valves are overridden if the following malfunctions occur:

In the event of a malfunction or improper manual operation of an air cycle pack that results in an overtemperature condition at the air cycle machine compressor or in the pack discharge duct, the pack flow control valve supplying air to that air cycle pack closes and the PACK FLOW CONTROL switchlight flowbar goes out.

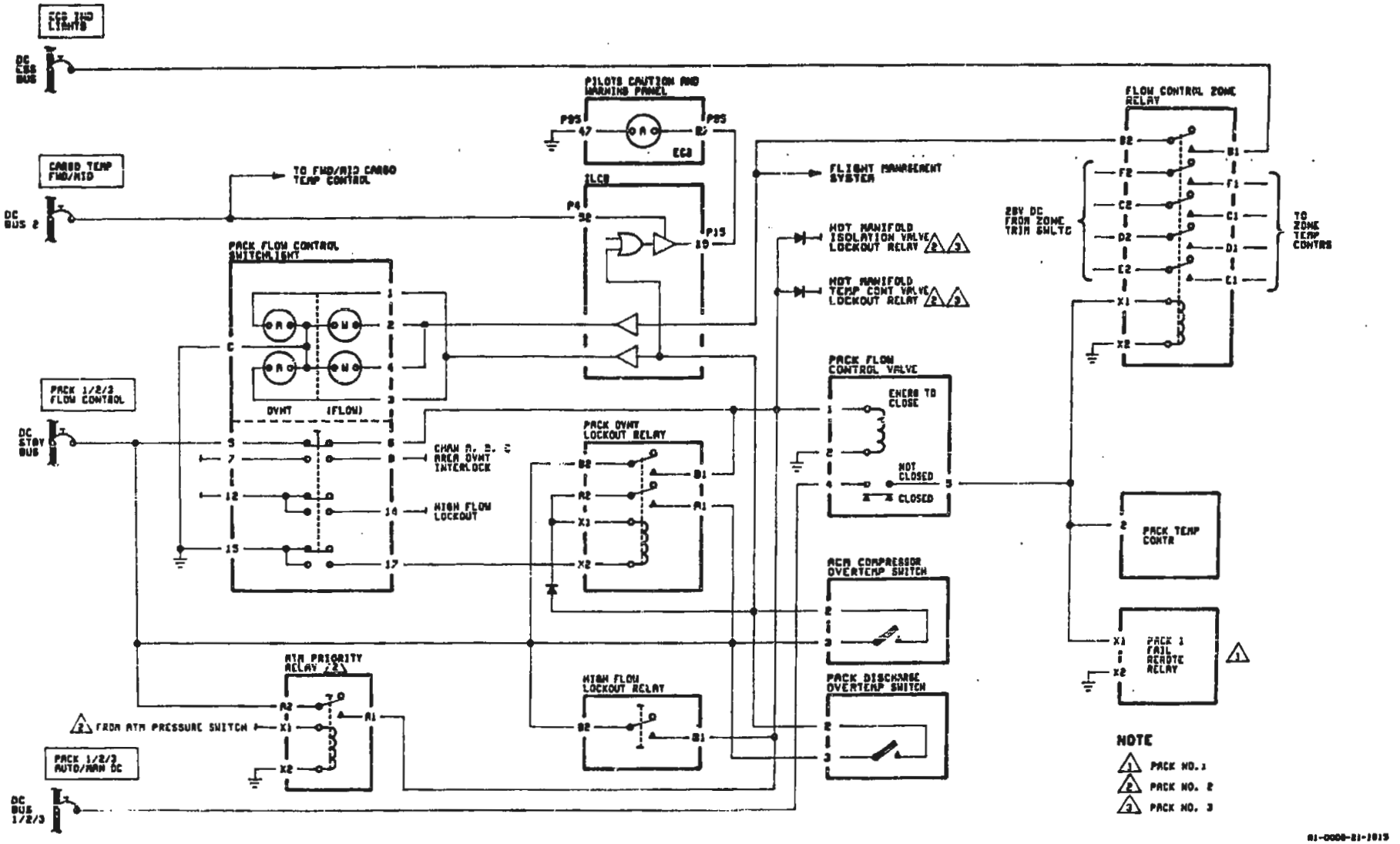
R If the duct between the distribution manifold and the
R pack flow control valve breaks, the pack flow sensor
R high-flow lockout relay closes the pack flow control
R valve, and the PACK FLOW CONTROL switchlight floubar
R goes out.

The following circuit description details how the above override control function is accomplished:

When the PACK FLOW CONTROL switchlight is depressed (latched in) (Ref. Fig. 2) 28V dc is removed from the pack flow control valve. At the same time, if the HOT AIR manifold switchlight (Ref. 21-41-00) (packs 2 and 3 only) is in the latched position, 28V dc is supplied to close the hot air temperature control valve.

When the pack flow control valve opens, the valve-open switch contacts close, and 28V dc is applied to light the flowbar in the PACK FLOW CONTROL switchlight. At the same time, 28V dc is applied to the pack temperature controller and the flow control/zone relay to allow the zone temperature control system to operate (Ref. 21-61-00).

If the temperature in the pack discharge reaches 200-210 degrees F (93-99 degrees C), or if the temperature in the air cycle machine (ACM) compressor reaches 415-435 degrees F (213-224 degrees C), one of the two overtemperature switches closes. If either overtemperature switch closes, 28V dc is applied to the coil of the automatic lockout relay and the OVHT light in the PACK FLOW CONTROl switchlight comes on. The ground for the relay is completed through closed



R Pack Flow Control Valve Simplified Schematic
R Figure 2

EFFECTIVITY: ALL

0018

(switchlight latched) contacts of the PACK FLOW CONTROL switchlight. These closed contacts allow the lockout relay to energize and applied 28V dc to close the pack flow control valve and, for Packs No. 2 and No. 3, the hot air temperature control valve and hot manifold isolation valve. When the valves are closed, the flowbars on both switchlights go out. A holding contact on the lockout relay holds the relay energized.

If the high-temperature condition has been corrected, the valves may be reset by releasing the PACK FLOW CONTROL, HOT AIR and hot manifold ISLN VALVE switchlights, which deenergizes and resets the lockout relay. Depressing the switchlight again (latched in) resets the system. If the bleed air duct pressure supplying the No. 2 air cycle pack decreases to or below ATM priority pressure switch closing pressure the switch closes. 28V dc is applied to the ATM priority control relay from the ATM (Ref. 29-11-00). When the relay closes 28V dc is applied to close the No. 2 pack flow control valve. When duct pressure increases to ATM priority pressure switch opening pressure, the switch opens, deenergizing the relay. The No. 2 pack flow control valve will open if system is selected for use.

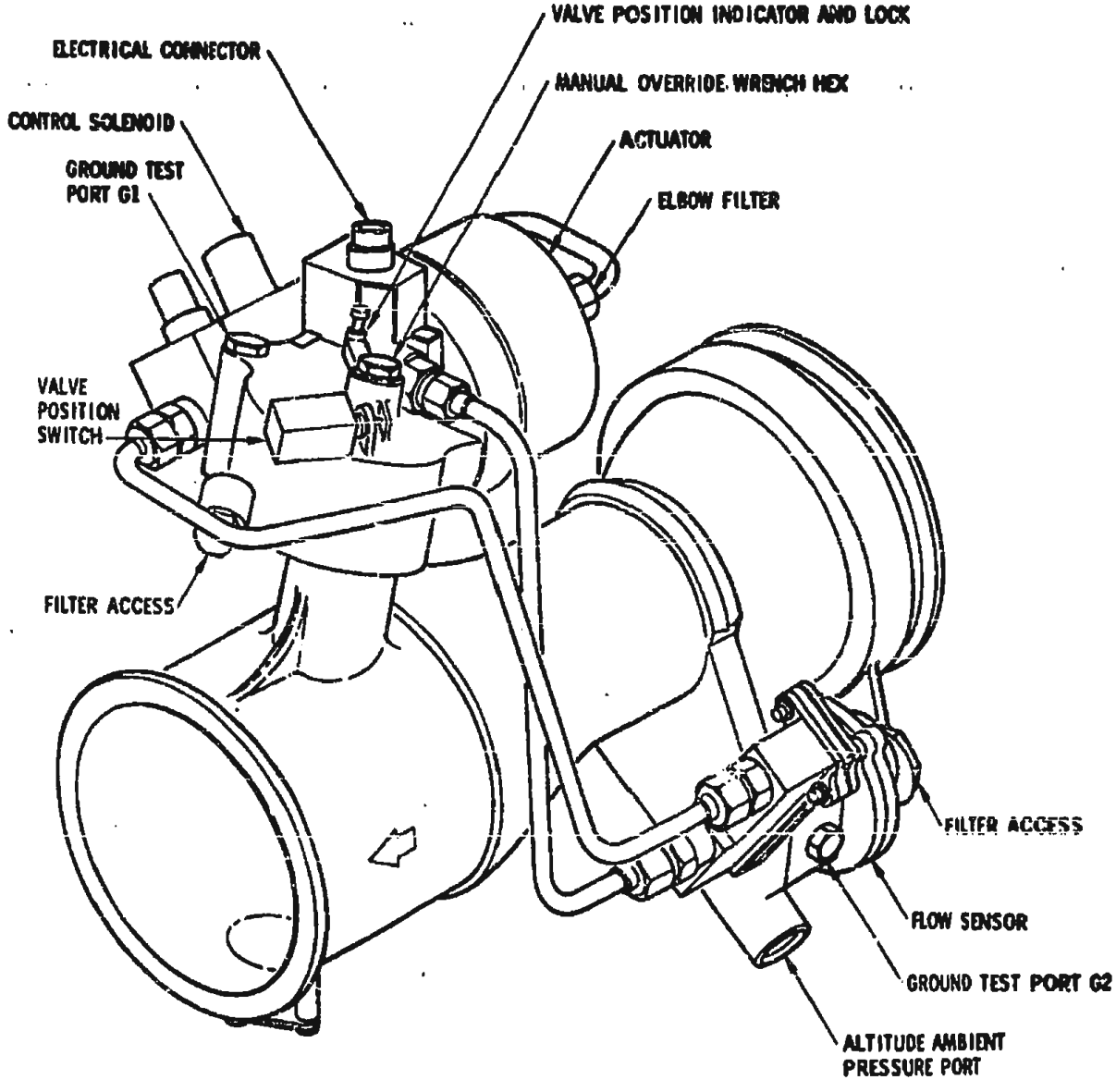
C. Component Description and Operation

(1) Pack Flow Control Valve

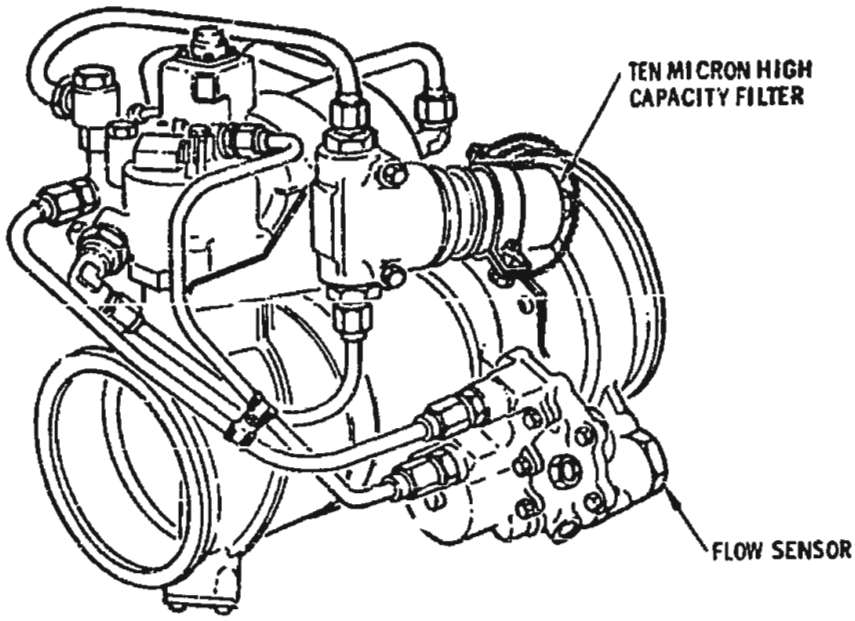
(a) Description

The pack flow control valve (Ref. Fig. 3) is a 6-inch-diameter flange-mounted, canted butterfly, venturi valve with an integral pneumatic actuator. The valve is solenoid-controlled. The valves (three) are mounted in the bottom of the fuselage below the mid electrical service center, zone 137. Each valve is used to control the flow of pneumatic system air (Ref. 36-00-00) into one of the three parallel air cycle packs in the air conditioning system.

The valve controls mass airflow to a maximum weight and volume of 150 pounds per minute, at a maximum discharge pressure of 50 psi, to a flight altitude of 21,000 feet. Above 21,000 feet, an altitude bias control reduces mass flow to maintain a constant amount proportional to the reduced needs at lower cabin pressures. Flow control calibration is made at an air inlet temperature of 450 degrees F (232 degrees C).



Pack Flow Control Valve
Figure 3 (Sheet 1)



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Pack Flow Control Valve
Figure 3 (Sheet 1)

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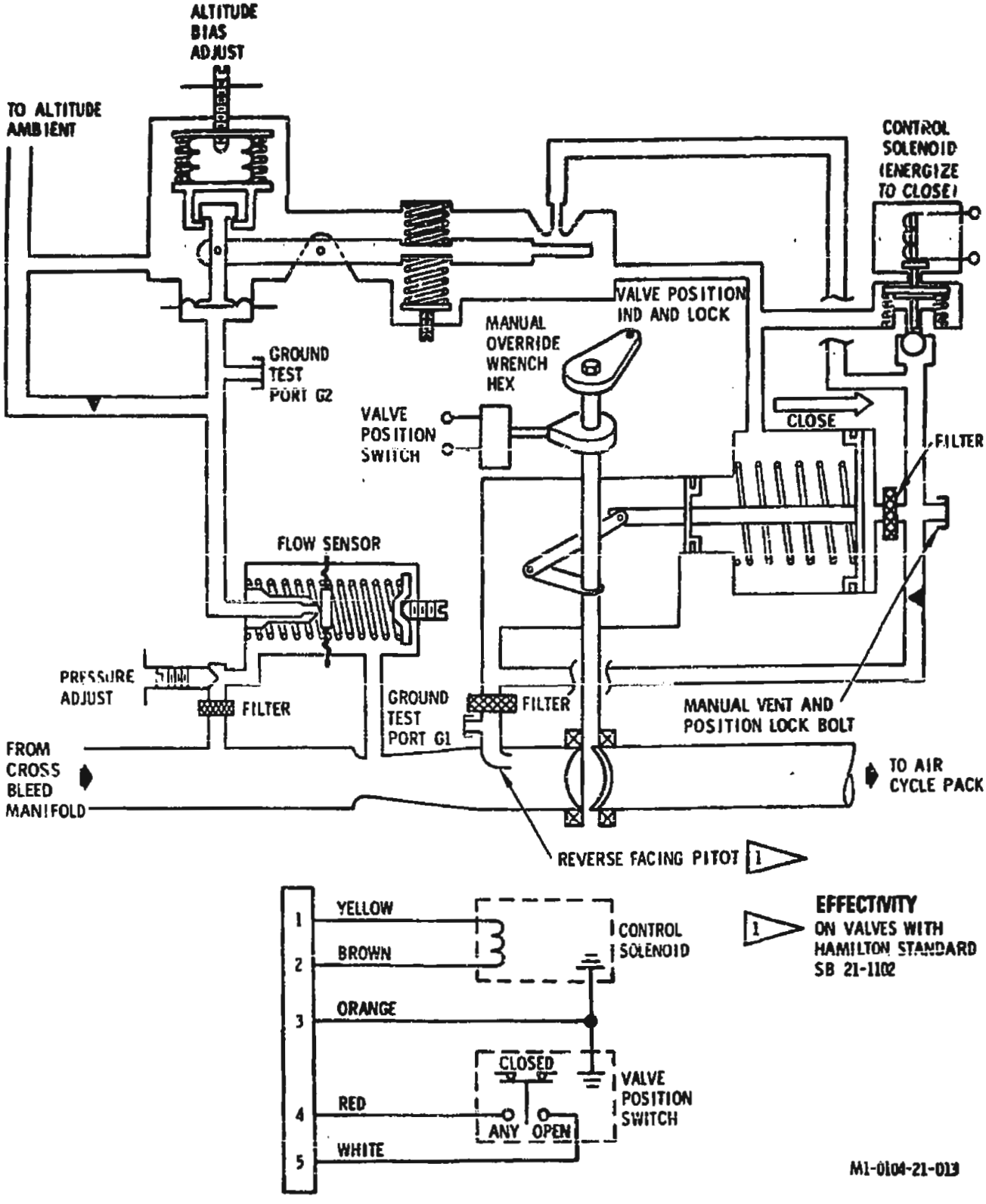


R Pack Flow Control Valve (Schematic)
R Figure 3 (Sheet 2)

Flow rate decreases slightly when inlet air temperature is higher, and increases slightly when inlet air temperature is lower.

The normally closed valve opens to the required modulating control position when the integral solenoid is deenergized and normal supply air pressure is available. When the solenoid is energized, actuator pressure is bled overboard to atmosphere, and the valve closes (or remains closed). A switch, mounted on the actuator housing, is actuated by the valve position indicator and manual override lever when the valve is closed. When the valve is in any open position, the normally closed contacts of the valve position switch turn on the flowbar in the PACK FLOW CONTROL switchlight. The valve position indicator and manual override lever are mounted on the end of the butterfly valve shaft. The manual override lever may be used to manually close the valve. A bolt inserted through the lever locks the valve in the closed position.

Test ports are provided in the pneumatic control assembly to facilitate ground checkout of the valve when it is installed in the aircraft and the system is not in operation. The test ports are used to check actuator open/close operation, flow control schedule, and valve close solenoid operation.

(b) Operation

The flow control function is performed by pneumatic controls located on the side of the pack flow control valve (Ref. Fig. 3). Air flowing through the valve venturi develops a differential pressure that moves a diaphram valve as function of airflow. When the airflow reduces, reducing the venturi differential pressure and closing the diaphram valve, the pressure on one side of the servo valve lever diaphram piston is reduced. The reduced pressure moves the servo valve lever to close the actuator metering valve. As the metering valve closes, the pressure increases to the actuator piston causing the actuator to open the butterfly valve. When the valve opens the airflow is restored counteracting the original decrease in airflow.

When aircraft altitude exceeds 21,000 feet altitude, the altitude bias bellows limits the

movement of the servo valve lever to maintain a nearly constant volume flow with normal cabin differential pressure.

When the PACK FLOW CONTROL switchlight is released, 28 volts dc is applied to the close solenoid. The solenoid opens a poppet valve that bleeds the actuator cylinder to aircraft ambient atmosphere. The high pressure on the small piston, the piston spring, and the low pressure on the control side of the actuator piston combine to close the butterfly valve.

(2) Duct Compensator

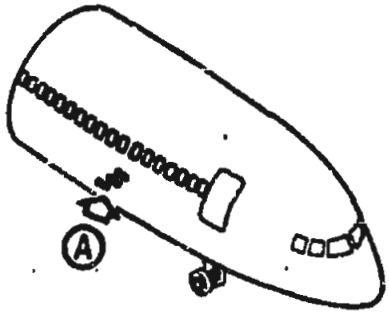
(a) Description

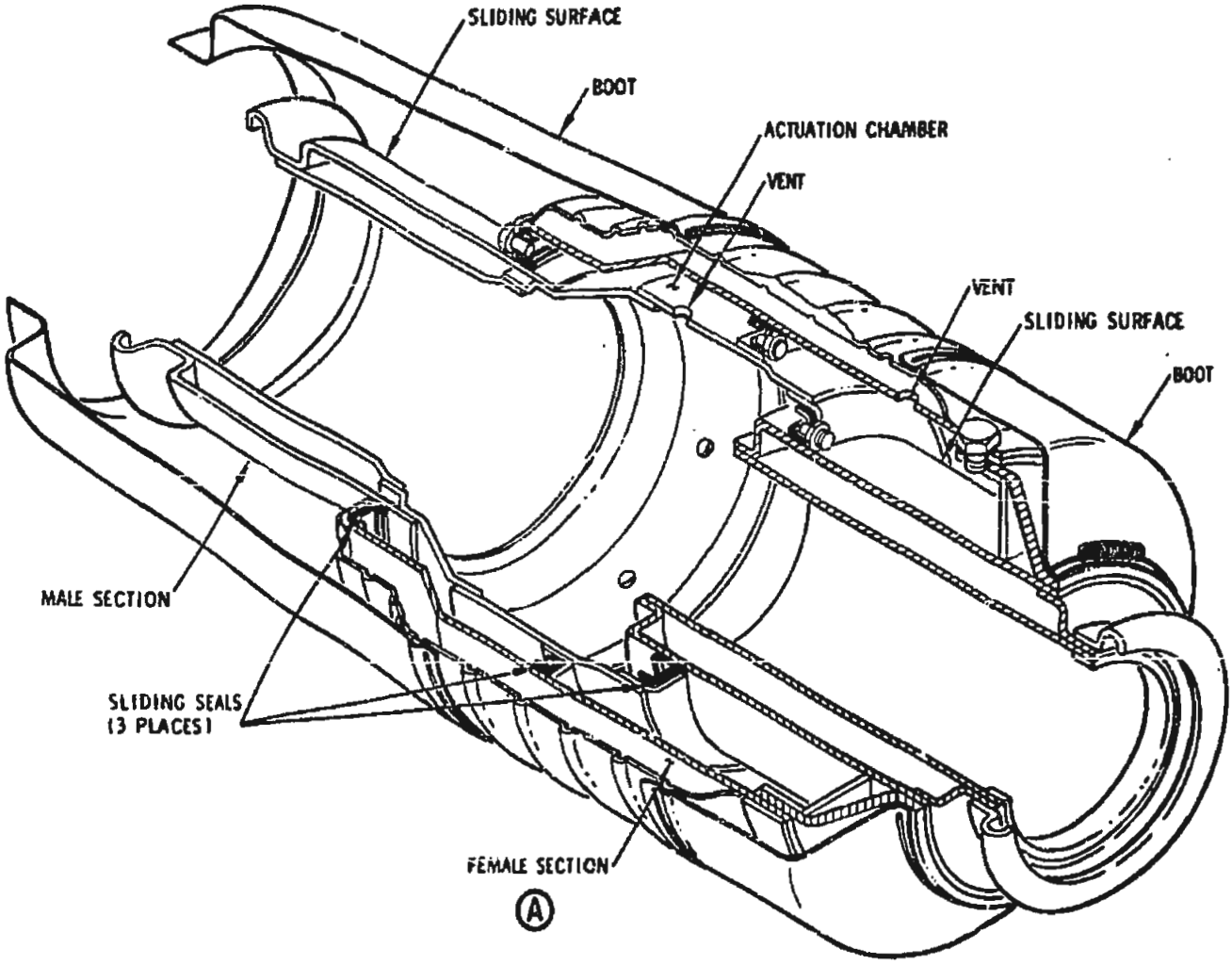
The duct compensator is a telescopic ducting assembly which uses sliding seals and the differential area principle so that it decreases in length (telescopes) with internal air pressure. The compensator maintains tension on a length of pneumatic ducting to compensate for changes in duct length due to temperature changes (Ref. Fig. 4).

There are three identical compensators used in the air conditioning system. A compensator is located in each of the three ducts from the pneumatic distribution manifold (Ref. 36-14-00) to the three air cycle packs (Ref. 21-51-00).

The compensators are installed under the floor of the aft portion of the forward cargo compartment, zone 124.

The compensators are flange-mounted at both ends, using V-band connectors, without gaskets between the compensator and the duct. Each compensator consists of two titanium sections with sliding seals, an insulating shell of phenolic resin-impregnated fiber glass covering the larger diameter section, and two rubberized fabric boots (one on each end). The mounting flanges mate with the 6-inch-diameter supply ducts, and the maximum shell diameter is 10.5 inches. The installed length of the compensator at normal temperatures is 16.8 inches. At very low duct temperatures the compensator extends to 17.2 inches, and at very high duct temperatures it telescopes to 12.8 inches.





M1-A00-21-045

Duct Compensator
Figure 4

The female (largest diameter) section of the compensator consists of two concentric tubular sections joined at the mounting flange end with bolts around the larger diameter perimeter for disassembly. The shorter inner tube, with the mounting flange, is double-walled. The outer tube is longer, with a sliding seal at the end opposite the mounting flange.

The male section is a two diameter, almost bell-shaped, unit. The smaller diameter, at the mounting flange end, consists of double-walled tubing. The tube flares out to the larger diameter and carries two sliding seals.

The sliding seal inside the female section slides on the outer surface of the smaller diameter (double-walled) portion of the male section. The two sliding seals on the larger end of the male section slide on the outer surface of the small diameter tube and the inner surface of the large diameter tube forming the female section.

The area between the inner and outer tubes of the female section is vented to ambient pressure. The area between the sliding seals is exposed to duct pressure. The outer diameter of the seals on the male section is larger than the inner diameter of the seal on the end of the female section, providing a differential in surface areas bearing duct air pressure.

The insulating shell covers the large diameter female section except for the area from the disassembly bolts to the mounting flange, where one of the boots is installed. The other longer boot extends from the end of the large diameter female section to the other mounting flange (male) end, and provides environmental protection to prevent damage to the otherwise exposed sliding surface on the male section.

(b) Operation

When the duct is pressurized, air pressure between the two seals on the inside end of the male section and the seal in the end of the female section tries to force these seals apart (Ref. Fig. 4). The compensator shortens (telescopes) to apply tension to the ducting between the pneumatic system manifold and the air conditioning service centers. Duct support bracketing between

pneumatic system manifold and the air conditiong service centers provides for fore and aft movement of the ducting to allow the duct compensator to uniformly apply tension to the ducting.

(3) Bleed Air Cleaner

(a) Description and Operation

A bleed air cleaner is installed in each pack supply duct. The bleed air cleaners remove dust and debris from the bleed air, before it enters the air cycle machine.

Three identical bleed air cleaners are located beneath the forward cargo compartment floor (Ref. Fig. 5).

As the air enters the air cleaner, it passes through vortex generators, or swirl vanes. The centrifugal motion causes the contaminants in the air to separate from the main airflow.

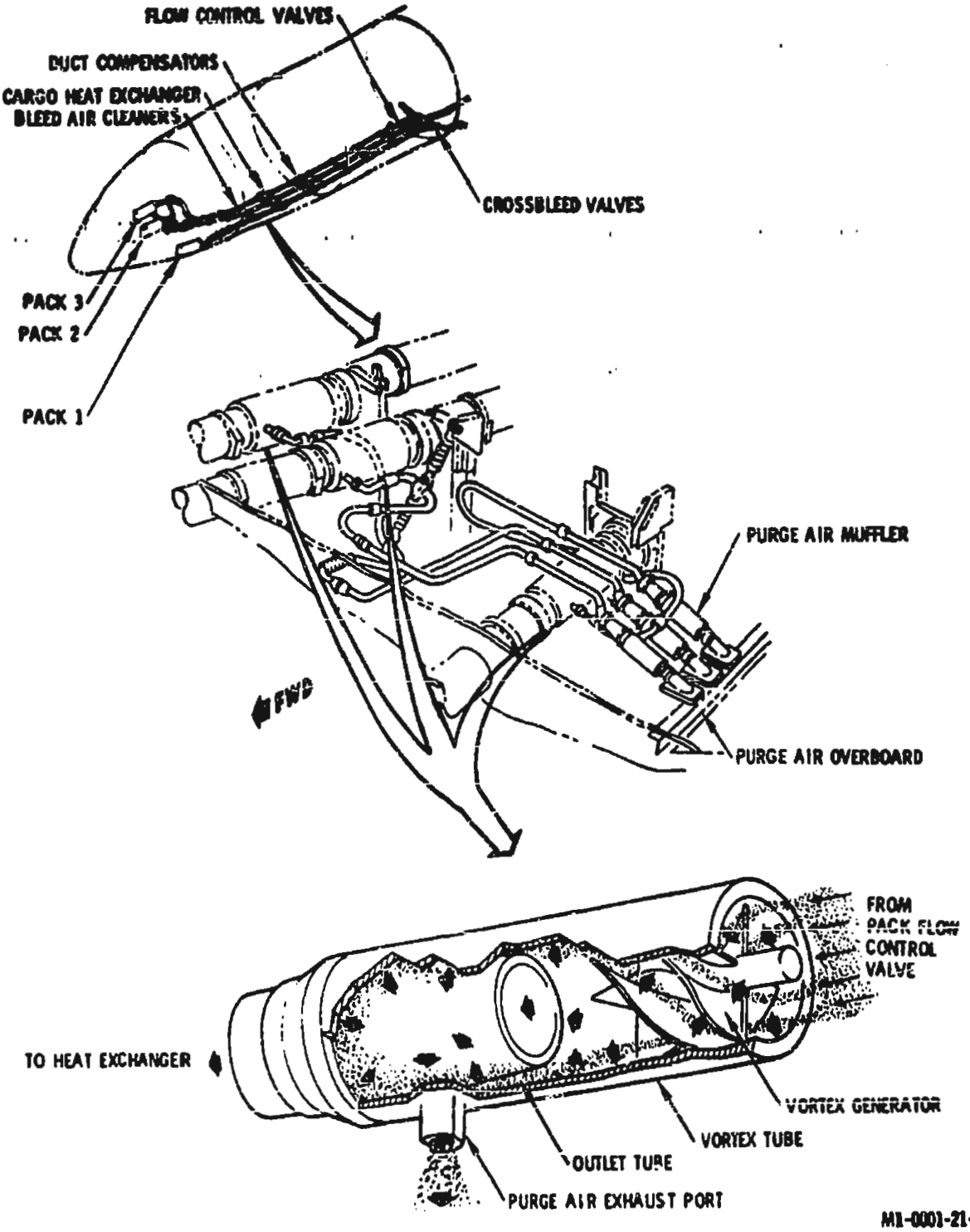
To eliminate noise of purge air, mufflers are installed in three purge air lines. These purge air lines discharge air overboard through three outlets in the side of the fuselage.

(4) Ozone Catalytic Converter

(a) Description and Operation

R Three ozone catalytic converters are installed, one in each air conditioning pack supply duct, prior to entering the air cycle machine. The purpose of the catalytic converters is to reduce the ambient ozone level to less than 0.1 part per million by volume (ppmv). All air supplied to the cabin will pass through the converters. The converters are stainless steel shells approximately 9 inches in diameter by 18 inches length, containing a metal (Palladium Oxide) catalyst which is dispersed on a ceramic substrate. The internal assembly is made with three 2 3/4 inch by 9 inch diameter, 400-mesh elements. The elements are mounted in silicone rubber to absorb aircraft shock and vibration.

The catalyst reduces ozone by combining two ozone molecules into free oxygen. Some heat is released in the process; however it is not significant; nor is the increase in oxygen content of the air



Bleed Air Cleaners
Figure 5

significant. The converters do not require any power or controls. The three catalytic converters are located in the bleed air supply ducts under the forward cargo compartment floor (Ref. Figure 6). Contamination due to unburned hydrocarbons, oil, dust has little or no effect on conversion performance. The catalyst is self cleaning and operation with clean air at cruise regenerates the material.

Performance of the converters is dependent on air flow and temperature. At cruise altitude above 31,000 feet and cold bleed temperatures 302°F (150°C), the ozone conversion efficiency is greater than 90%. This efficiency and the natural ozone breakdown in the recirculating distribution system results in a cabin ozone level of 0.1 ppmv with ambient ozone level of 1.5 PPMV.

3. Preconditioned Ground Air System

A. Description

The two preconditioned ground air connections (Ref. Para. 5A) and their check valves (Ref. 21-21-28) are used to deliver temperature-controlled air, from a low-pressure ground air source through the cold air plenum to the normal distribution systems serving the flight station, the three cabin zones, and the galley. The ground air connections are in the lower right forward fuselage just outboard of the aft end of the nose wheel well behind two quick-latching-type hinged doors.

The two preconditioned ground air check valves are located in the ducts between the ground air connections and the air cycle pack discharge ducts.

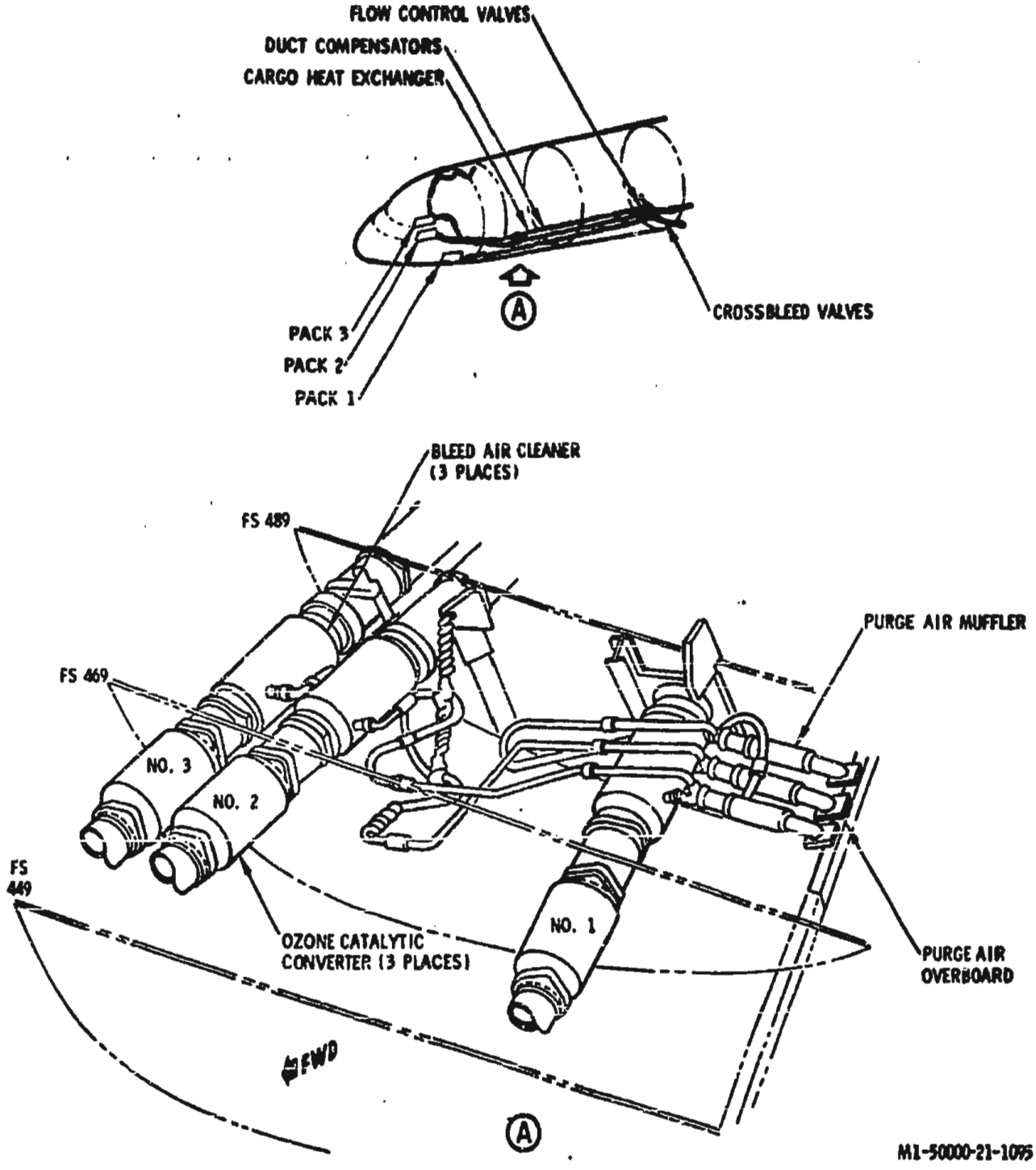
B. Operation

Air supplied to the preconditioned ground air connections is carried through ducts to the No. 1 and No. 2 air cycle pack discharge ducts at the top of the right environmental control system (ECS) compartment. The check valves prevent loss of pack discharge air through the ground air connections when the packs are in use.

C. Component Description and Operation

(1) Preconditioned Ground Air Connection

(a) Description and Operation



Ozone Catalytic Converter
Figure 6

Two preconditioned ground air connections are provided to allow two standard 8-inch low-pressure ground air supply hoses to be connected to the aircraft when pneumatic system high-pressure supply air is not available (Ref. 36-00-00).

The two connections are in the right lower forward fuselage, just outboard of the aft end of the nose wheel well, behind two quick-latching hinged doors, zone 118. Ducts from each connection extend upward to the top of the right environmental control system (ECS) compartment to connect to the No. 1 and No. 2 air cycle pack discharge ducts.

The connection adapter, slightly recessed into the fuselage, accepts the standard 8-inch, two-prong, insert-and-twist supply hose connector.

With the aircraft systems not operating, it is not necessary to make any aircraft control system selections before connecting a low-pressure ground air source to either or both of the preconditioned ground air connectors. After opening the cover door over a connection, the supply hose connector may be inserted and twisted slightly to lock it into position.

Preconditioned air delivered through the connectors opens the check valves in the ducts above the connectors and passes through the No. 1 and No. 2 air cycle pack discharge ducting into the cold air plenum.

From there, the air follows normal distribution ducting to the flight station, the forward cabin, mid cabin, and aft cabin, and the galley.

When the low-pressure ground air source is shut down, the supply hose is removed, and the cover door is closed and latched.

(2) Preconditioned Ground Air Check Valve

(a) Description and Operation

Two preconditioned ground air check valves are in the ducts between the preconditioned ground air connections and the No. 1 and No. 2 air cycle pack discharge ducts in the right environmental control system (ECS) compartment, zone 118.

The valves are used to prevent loss of air cycle pack discharge air through the preconditioned ground air connections when they are not in use.

These two valves are identical to, and interchangeable with, the three air cycle pack discharge check valves (Ref. 21-51-00). Each valve is an 8-inch-diameter, six-sector, disc-type check valve. Each of the six pie-cut-shaped flappers is hinged at the outer perimeter and spring-loaded to close. The valve seats form a six armed cross through the center of the valve.

Six semihard bumpers, located around the inside of the valve housing, provide flapper open position stops. The bumpers are located so that the center of the flapper contacts the stop to limit hinge stress. The bumpers hold the flapper up into the airstream to maintain a positive air pressure on the flapper to prevent flutter.

The preconditioned ground air check valves open, when a low-pressure ground air source is connected to the preconditioned ground air connections, to deliver temperature-controlled air to the aircraft distribution systems. When air is not flowing through the connectors, the check valves are held closed by the springs on each flapper. When the air cycle packs are in use, pack discharge air pressure aids in holding the check valves closed.

R

SUPPLY SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting supply system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the supply system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

Table 101

	FIGURE	TITLE
	101	Component Location Index
	102	Component Locator Diagram
	103	PACK FLOW CONTROL OVHT On
	104	PACK FLOW CONTROL Flowbar Off, Switchlight In, OVHT Off
	105	PACK FLOW CONTROL Flowbar On, Switchlight Out
R	106	Oil Fumes or Odors in Cabin
	SCHEM 1	No. 1 Pack Flow Control Schematic
	SCHEM 2	No. 2 Pack Flow Control Schematic
	SCHEM 3	No. 3 Pack Flow Control Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
PACK FLOW CONTROL 1, 2, 3	3	PILOT'S OVHD CB PNL CB 1	•
PACK 1, 2, 3 AUTO/MAN	2	VERTICAL CB PNL CB 3	•
ECS AIR TEMP IND	1	VERTICAL CB PNL CB 3	•
CARGO TEMP FWD/MID	1	VERTICAL CB PNL CB 3	•
ECS IND LT	1	VERTICAL CB PNL CB 3	•
CONTROL BOX, INDICATOR LIGHTS (ILCB):			
CARD 1A33 3317-A1	1	FESC/112AB	33-17-04
CARD 1A36 3317-A1	1	FESC/112AB	33-17-04
PACK FLOW CONTROL VALVE 1, 2, 3	3	MESC UNDER FLOOR FS 943-983 ZONE 137	21-21-01

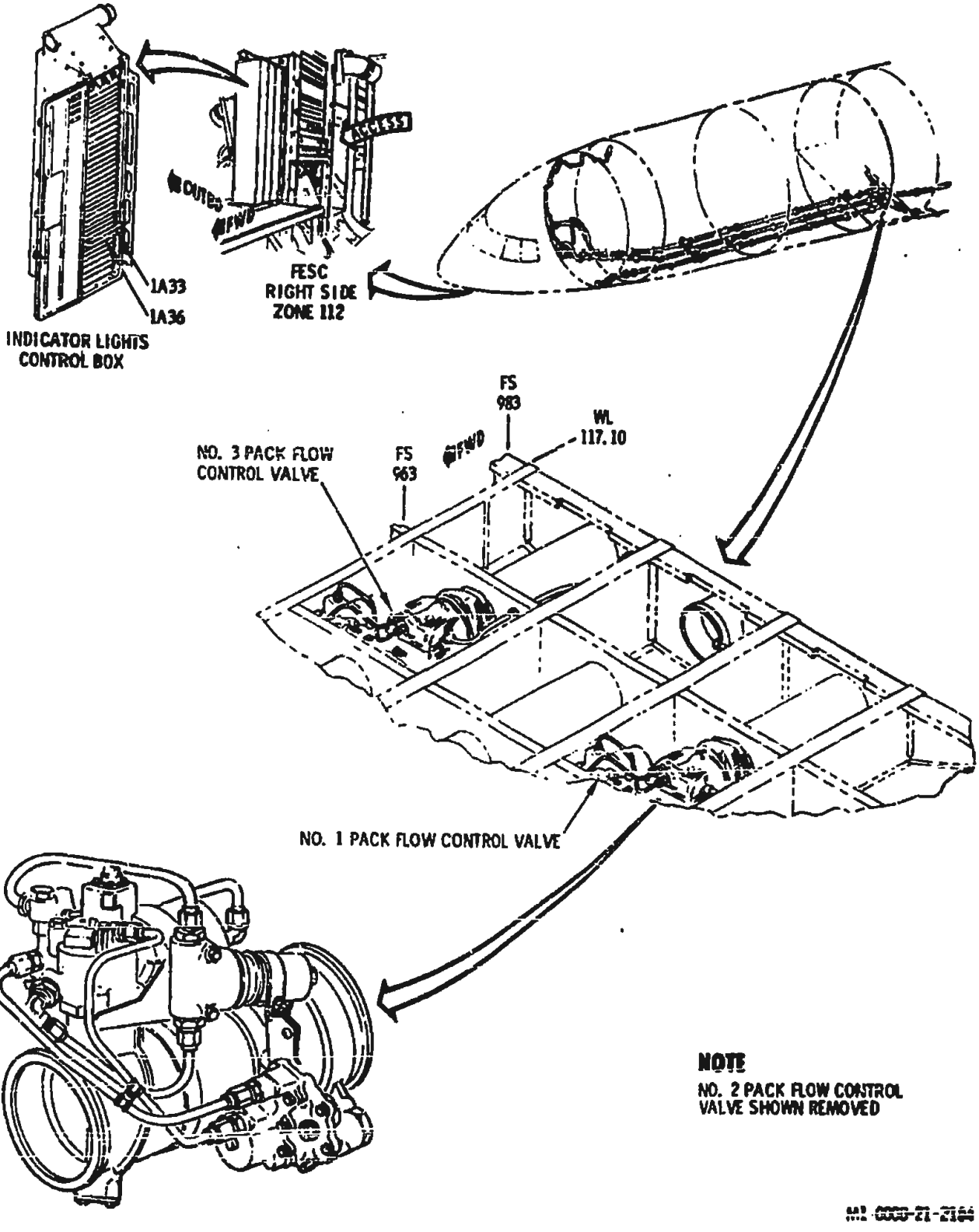
• SEE WM EQUIPMENT LIST

M1-0000-21-2183

R Component Location Index
R Figure 101

EFFECTIVITY: ALL

001B



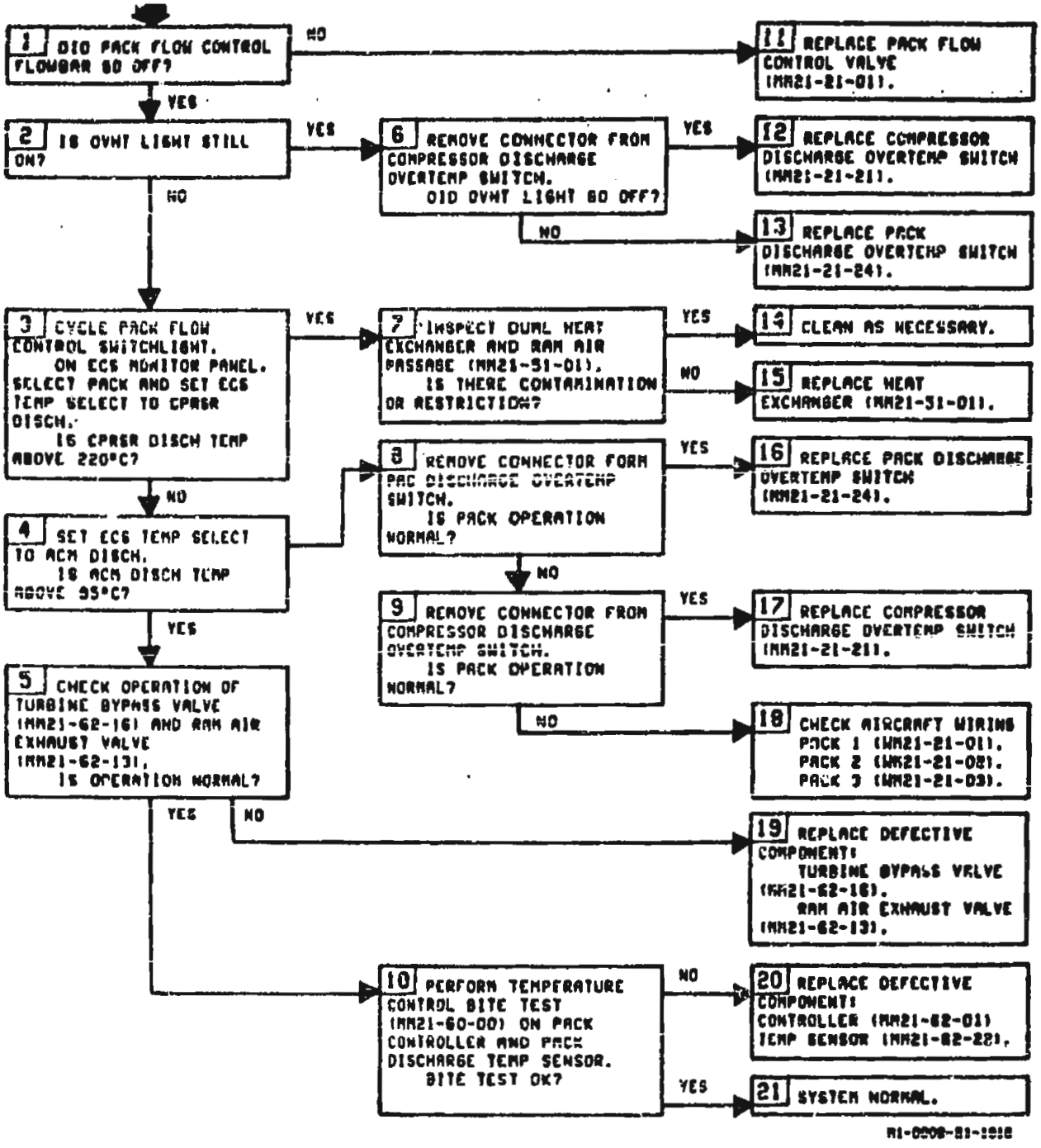
M1 0000-21-2184

R
R

Component Locator Diagram
Figure 102

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC (MM36-00-00)
CB'S IN: 1W3,4,5; 3B12; 3V5,7,17;3WD
PACK FLOW CONTROL SWITCHLIGHTS IN

PACK FLOW CONTROL OVHT LIGHT ON


1 DID PACK FLOW CONTROL FLOWBAR GO OFF?
NO
11 REPLACE PACK FLOW CONTROL VALVE (MM21-21-01).
YES
2 IS OVHT LIGHT STILL ON?
YES
6 REMOVE CONNECTOR FROM COMPRESSOR DISCHARGE OVERTEMP SWITCH. DID OVHT LIGHT GO OFF?
YES
12 REPLACE COMPRESSOR DISCHARGE OVERTEMP SWITCH (MM21-21-21).
NO
13 REPLACE PACK DISCHARGE OVERTEMP SWITCH (MM21-21-24).
NO
3 CYCLE PACK FLOW CONTROL SWITCHLIGHT. ON ECS MONITOR PANEL. SELECT PACK AND SET ECS TEMP SELECT TO CPRSR DISCH. IS CPRSR DISCH TEMP ABOVE 220°C?
YES
7 INSPECT DUAL HEAT EXCHANGER AND RAM AIR PASSAGE (MM21-51-01). IS THERE CONTAMINATION OR RESTRICTION?
YES
14 CLEAN AS NECESSARY.
NO
15 REPLACE HEAT EXCHANGER (MM21-51-01).
NO
4 SET ECS TEMP SELECT TO ACM DISCH. IS ACM DISCH TEMP ABOVE 95°C?
8 REMOVE CONNECTOR FORM PAC DISCHARGE OVERTEMP SWITCH. IS PACK OPERATION NORMAL?
YES
16 REPLACE PACK DISCHARGE OVERTEMP SWITCH (MM21-21-24).
NO
YES
9 REMOVE CONNECTOR FROM COMPRESSOR DISCHARGE OVERTEMP SWITCH. IS PACK OPERATION NORMAL?
YES
17 REPLACE COMPRESSOR DISCHARGE OVERTEMP SWITCH (MM21-21-21).
NO
18 CHECK AIRCRAFT WIRING PACK 1 (MM21-21-01). PACK 2 (MM21-21-02). PACK 3 (MM21-21-03).
5 CHECK OPERATION OF TURBINE BYPASS VALVE (MM21-62-16) AND RAM AIR EXHAUST VALVE (MM21-62-13). IS OPERATION NORMAL?
YES
NO
19 REPLACE DEFECTIVE COMPONENT: TURBINE BYPASS VALVE (MM21-62-16). RAM AIR EXHAUST VALVE (MM21-62-13).
10 PERFORM TEMPERATURE CONTROL BITE TEST (MM21-60-00) ON PACK CONTROLLER AND PACK DISCHARGE TEMP SENSOR. BITE TEST OK?
NO
20 REPLACE DEFECTIVE COMPONENT: CONTROLLER (MM21-62-01) TEMP SENSOR (MM21-62-22).
YES
21 SYSTEM NORMAL.

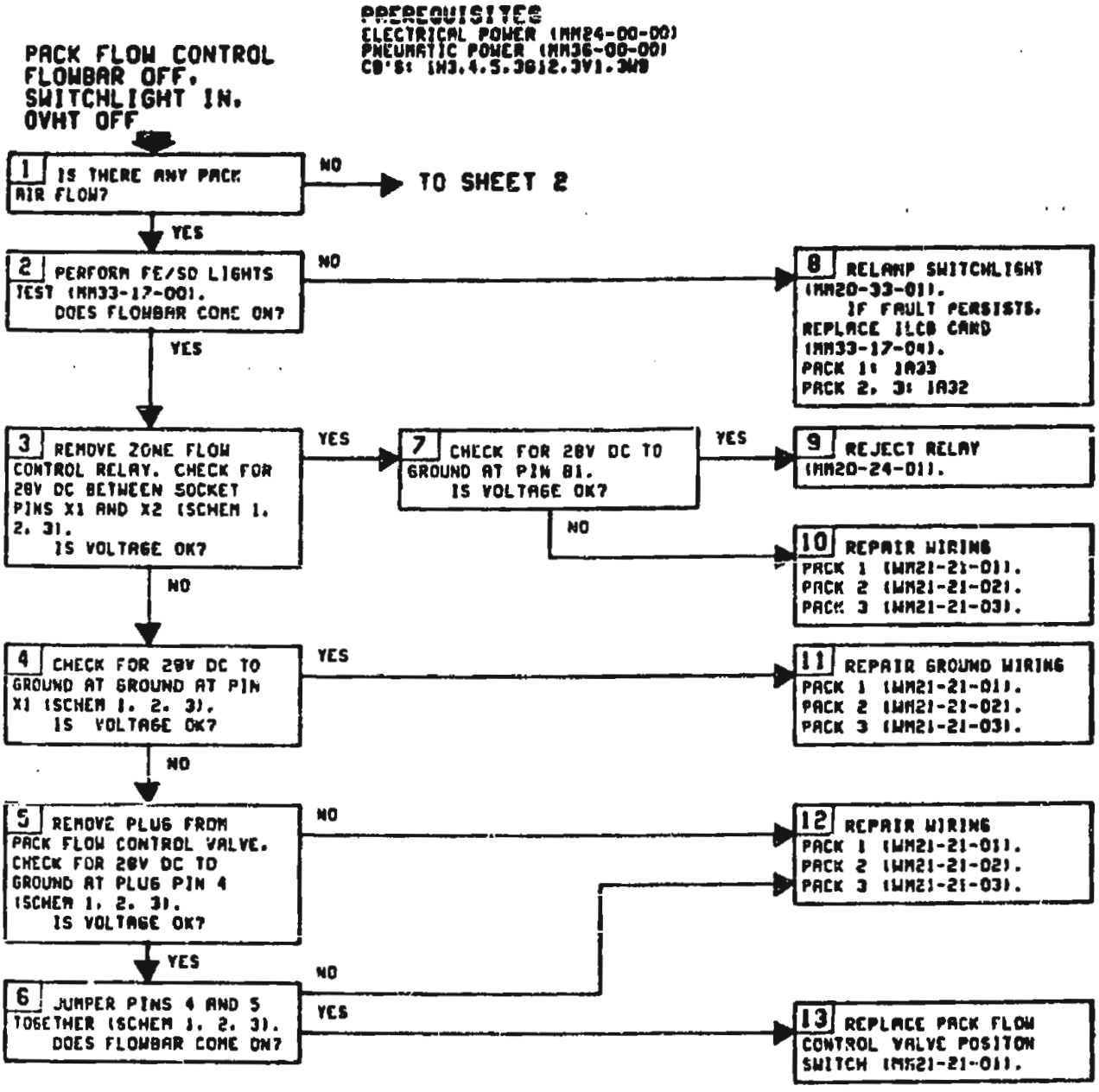
R1-0008-21-1818

R PACK FLOW CONTROL OVHT On
R Figure 103

EFFECTIVITY: ALL

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC POWER (MM36-00-00)
CB'S: (H3,4,5,3B12,3V1,3W9


PACK FLOW CONTROL FLOWBAR OFF, SWITCHLIGHT IN, OVHT OFF
1 IS THERE ANY PACK AIR FLOW?
NO
TO SHEET 2
YES
2 PERFORM FE/SD LIGHTS TEST (MM33-17-001). DOES FLOWBAR COME ON?
NO
8 RELAMP SWITCHLIGHT (MM20-33-01). IF FAULT PERSISTS, REPLACE ILCB CARD (MM33-17-04). PACK 1: 1A33 PACK 2, 3: 1A32
YES
3 REMOVE ZONE FLOW CONTROL RELAY. CHECK FOR 28V DC BETWEEN SOCKET PINS X1 AND X2 (SCHEM 1, 2, 3). IS VOLTAGE OK?
YES
7 CHECK FOR 28V DC TO GROUND AT PIN B1. IS VOLTAGE OK?
YES
9 REJECT RELAY (MM20-24-01).
NO
10 REPAIR WIRING PACK 1 (WM21-21-01). PACK 2 (WM21-21-02). PACK 3 (WM21-21-03).
NO
4 CHECK FOR 28V DC TO GROUND AT GROUND AT PIN X1 (SCHEM 1, 2, 3). IS VOLTAGE OK?
YES
11 REPAIR GROUND WIRING PACK 1 (WM21-21-01). PACK 2 (WM21-21-02). PACK 3 (WM21-21-03).
NO
5 REMOVE PLUG FROM PACK FLOW CONTROL VALVE. CHECK FOR 28V DC TO GROUND AT PLUG PIN 4 (SCHEM 1, 2, 3). IS VOLTAGE OK?
NO
12 REPAIR WIRING PACK 1 (WM21-21-01). PACK 2 (WM21-21-02). PACK 3 (WM21-21-03).
YES
NO
6 JUMPER PINS 4 AND 5 TOGETHER (SCHEM 1, 2, 3). DOES FLOWBAR COME ON?
YES
13 REPLACE PACK FLOW CONTROL VALVE POSITON SWITCH (MM21-21-01).

MJ-0005-21-5053

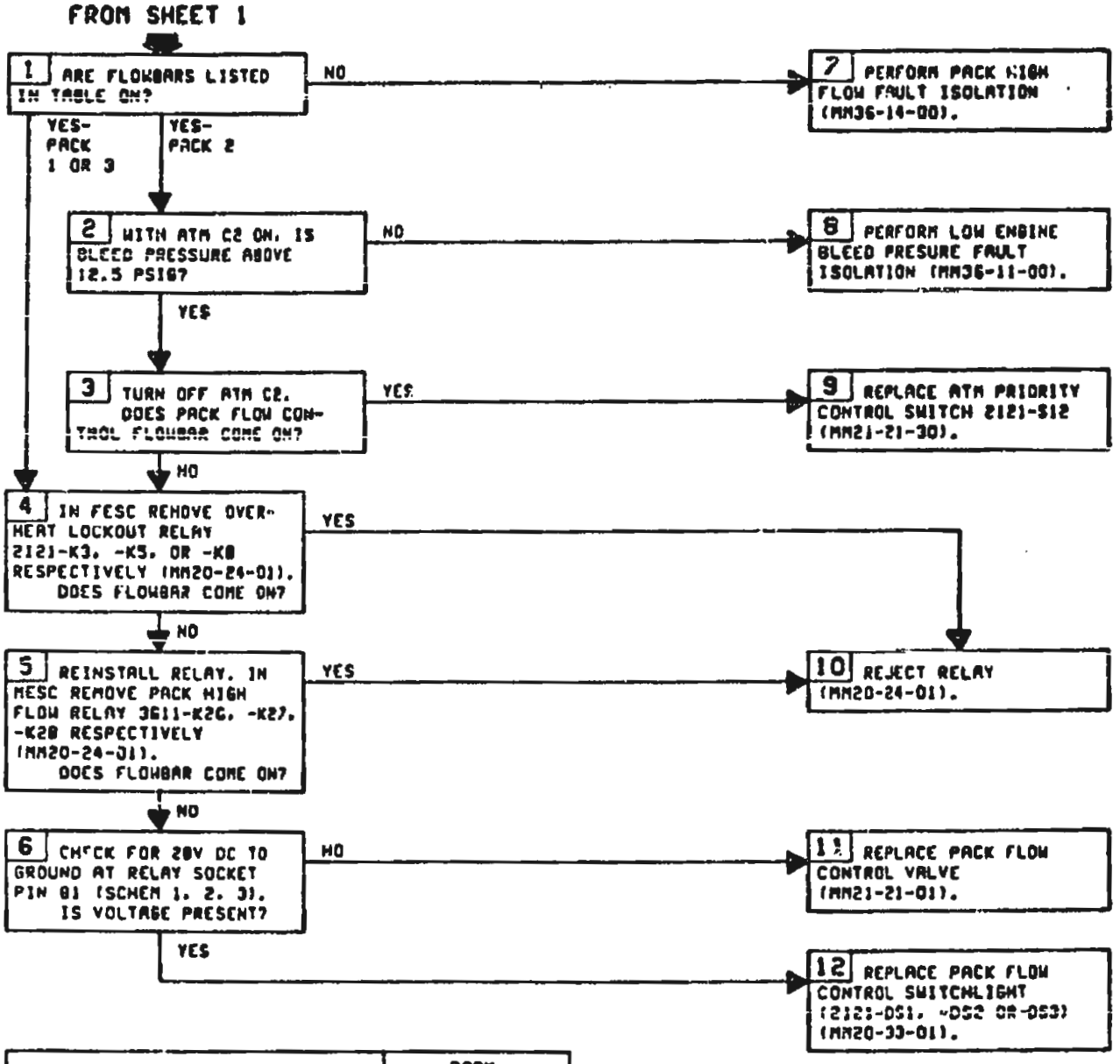
R
R
R

PACK FLOW CONTROL Flowbar Off, Switchlight In, OVHT Off
Figure 104 (Sheet 1)

EFFECTIVITY: ALL

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC (MM36-00-00)
CB'S IN: 1H3, 4, 5; 3B12; 3V5, 7, 17; 3W8
PACK FLOW CONTROL SWITCHLIGHTS IN


FROM SHEET 1
1 ARE FLOWBARS LISTED IN TABLE ON?
NO
7 PERFORM PACK HIGH FLOW FAULT ISOLATION (MM36-14-00).
YES- PACK 1 OR 3
YES- PACK 2
2 WITH ATM C2 ON, IS BLEED PRESSURE ABOVE 12.5 PSIG?
NO
8 PERFORM LOW ENGINE BLEED PRESURE FAULT ISOLATION (MM36-11-00).
YES
3 TURN OFF ATM C2. DOES PACK FLOW CONTROL FLOWBAR COME ON?
YES
9 REPLACE ATM PRIORITY CONTROL SWITCH 2121-S12 (MM21-21-30).
NO
4 IN FESC REMOVE OVERHEAT LOCKOUT RELAY 2121-K3, -K5, OR -K8 RESPECTIVELY (MM20-24-01). DOES FLOWBAR COME ON?
YES
NO
5 REINSTALL RELAY. IN MESC REMOVE PACK HIGH FLOW RELAY 3611-K26, -K27, -K28 RESPECTIVELY (MM20-24-01). DOES FLOWBAR COME ON?
YES
10 REJECT RELAY (MM20-24-01).
NO
6 CHECK FOR 28V DC TO GROUND AT RELAY SOCKET PIN 81 (SCHEM 1, 2, 3). IS VOLTAGE PRESENT?
NO
11 REPLACE PACK FLOW CONTROL VALVE (MM21-21-01).
YES
12 REPLACE PACK FLOW CONTROL SWITCHLIGHT (2121-DS1, -DS2 OR -DS3) (MM20-33-01).

SWITCHLIGHTS IN AND FLOWBARS	PACK		
	1	2	3
LEFT CROSS BLEED VALVE	X	X	
RIGHT CROSS BLEED VALVE		X	X
AFT ISLN VALVE		X	
ENG ISLN VALVE (ENG RUNNING)	X		X

R1-0008-21-5301

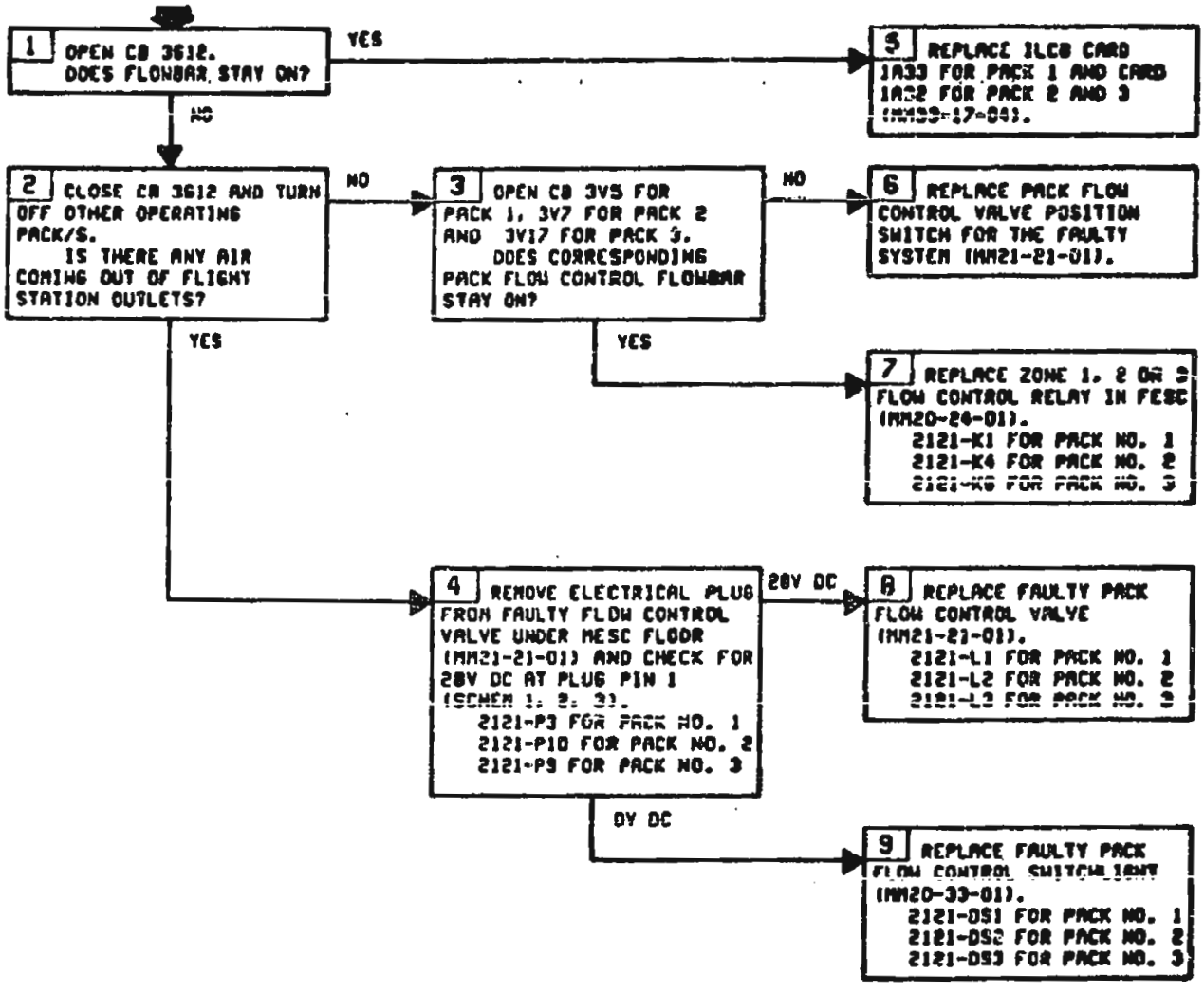
R R R PACK FLOW CONTROL Flowbar Off, Switchlight In, OVHT Off
Figure 104 (Sheet 2)

EFFECTIVITY: ALL

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC (MM36-00-00)
CB'S: 1H3, 4, 5, 3B12; 3V5, 7, 17; 3H8

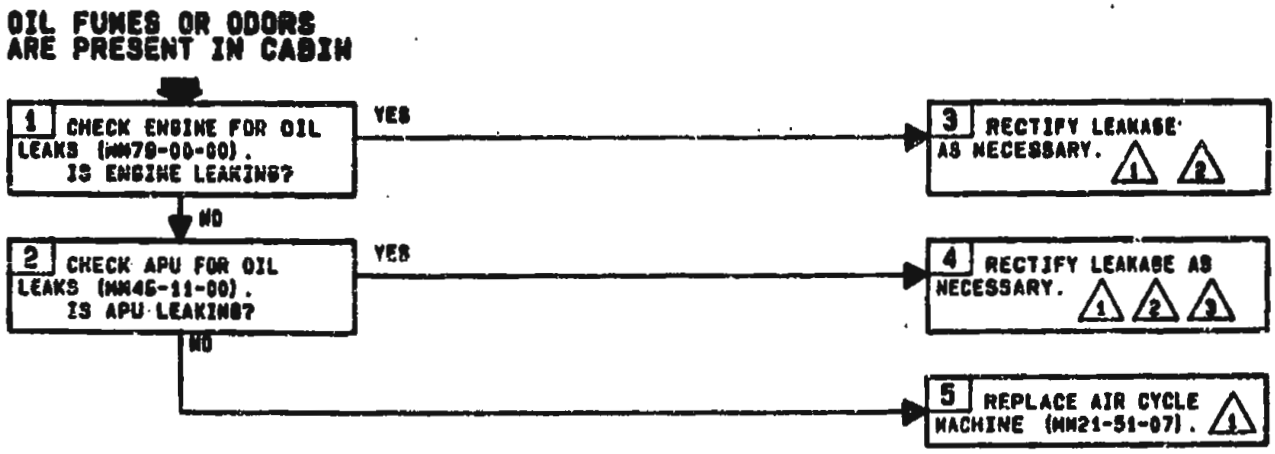
ANY PACK FLOW CONTROL FLOWBAR ON WITH SWITCHLIGHT OUT


1 OPEN CB 3B12. DOES FLOWBAR STAY ON?
YES
5 REPLACE ILCB CARD 1A33 FOR PACK 1 AND CARD 1A32 FOR PACK 2 AND 3 (MM33-17-04).
NO
2 CLOSE CB 3B12 AND TURN OFF OTHER OPERATING PACK/S. IS THERE ANY AIR COMING OUT OF FLIGHT STATION OUTLETS?
NO
3 OPEN CB 3V5 FOR PACK 1, 3V7 FOR PACK 2 AND 3V17 FOR PACK 3. DOES CORRESPONDING PACK FLOW CONTROL FLOWBAR STAY ON?
NO
6 REPLACE PACK FLOW CONTROL VALVE POSITION SWITCH FOR THE FAULTY SYSTEM (MM21-21-01).
YES
7 REPLACE ZONE 1, 2 OR 3 FLOW CONTROL RELAY IN FESC (MM20-24-01).
2121-K1 FOR PACK NO. 1
2121-K4 FOR PACK NO. 2
2121-K6 FOR PACK NO. 3
YES
4 REMOVE ELECTRICAL PLUG FROM FAULTY FLOW CONTROL VALVE UNDER MESC FLOOR (MM21-21-01) AND CHECK FOR 28V DC AT PLUG PIN 1 (SCHEM 1, 2, 3).
2121-P3 FOR PACK NO. 1
2121-P10 FOR PACK NO. 2
2121-P9 FOR PACK NO. 3
28V DC
8 REPLACE FAULTY PACK FLOW CONTROL VALVE (MM21-21-01).
2121-L1 FOR PACK NO. 1
2121-L2 FOR PACK NO. 2
2121-L3 FOR PACK NO. 3
0V DC
9 REPLACE FAULTY PACK FLOW CONTROL SWITCHLIGHT (MM20-33-01).
2121-DS1 FOR PACK NO. 1
2121-DS2 FOR PACK NO. 2
2121-DS3 FOR PACK NO. 3

AJ-0001-21-3080

R
R PACK FLOW CONTROL Flowbar On, Switchlight Out
Figure 105

PREREQUISITES
NONE


OIL FUMES OR ODORS ARE PRESENT IN CABIN
1 CHECK ENGINE FOR OIL LEAKS (MM78-00-00). IS ENGINE LEAKING?
YES
NO
3 RECTIFY LEAKAGE AS NECESSARY. 1 2
2 CHECK APU FOR OIL LEAKS (MM45-11-00). IS APU LEAKING?
YES
NO
4 RECTIFY LEAKAGE AS NECESSARY. 1 2 3
5 REPLACE AIR CYCLE MACHINE (MM21-51-07). 1

NOTE

1. CLEANING OF PNEUMATIC AND ECS DUCTING IS REQUIRED (REF. 36-00-00, CLEANING PROCEDURE).
2. DUCT COMPENSATORS SHOULD BE REMOVED AND CLEANED (REF. 21-21-05, MAINTENANCE PRACTICES).
3. AN INTERNAL OIL LEAK WILL HAVE AN UNDESIRABLE EFFECT ON APU PERFORMANCE AND THE APU SHOULD BE CHANGED AS SOON AS PRACTICABLE.

M1-0900-21-0007

R
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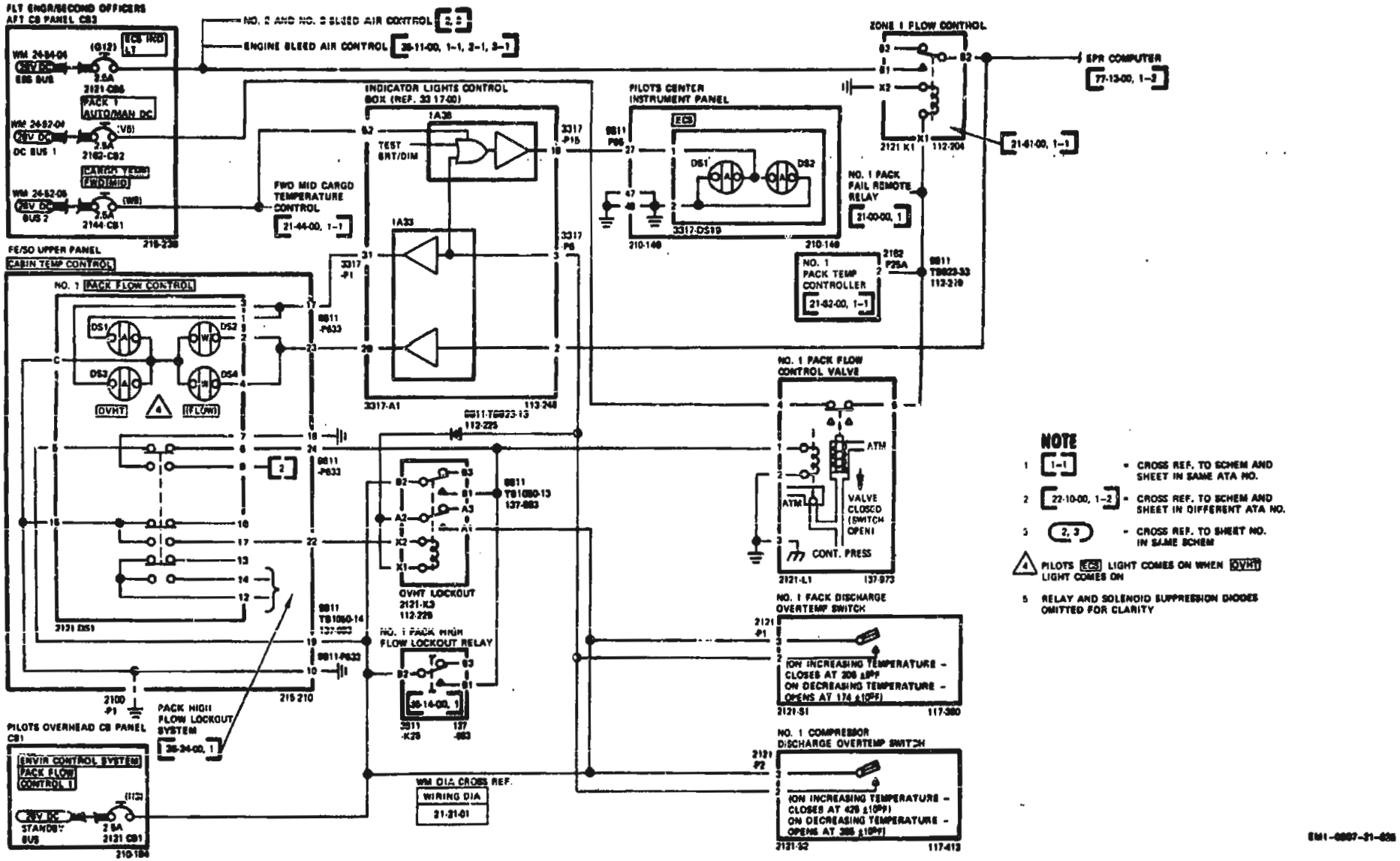
Oil Fumes or Odors in Cabin
Figure 106

EFFECTIVITY: ALL

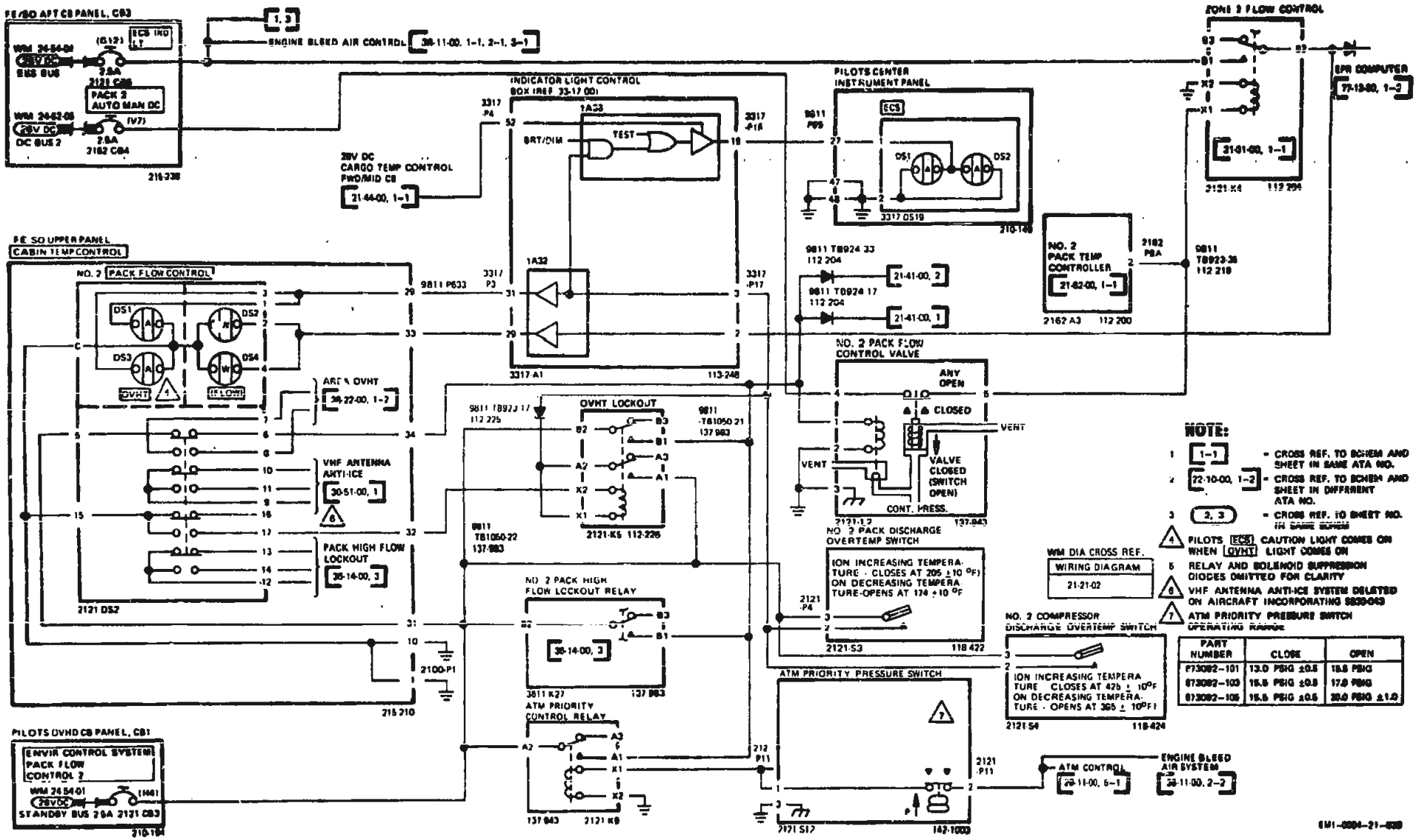
001B


FLT ENGR/SECOND OFFICERS AFT CB PANEL CB2
NO. 2 AND NO. 3 BLEED AIR CONTROL
ENGINE BLEED AIR CONTROL
ZONE 1 FLOW CONTROL
EPR COMPUTER
INDICATOR LIGHTS CONTROL BOX (REF. 33-17-00)
PILOTS CENTER INSTRUMENT PANEL
FWD MID CARGO TEMPERATURE CONTROL
NO. 1 PACK FAIL REMOTE RELAY
NO. 1 PACK TEMP CONTROLLER
FE/SO UPPER PANEL
CABIN TEMP CONTROL
NO. 1 PACK FLOW CONTROL
NO. 1 PACK FLOW CONTROL VALVE
OVHT LOCKOUT
NO. 1 PACK HIGH FLOW LOCKOUT RELAY
PACK HIGH FLOW LOCKOUT SYSTEM
NO. 1 PACK DISCHARGE OVERTEMP SWITCH
NO. 1 COMPRESSOR DISCHARGE OVERTEMP SWITCH
PILOTS OVERHEAD CB PANEL CB1
WM DIA CROSS REF.
WIRING DIA
21-21-01
NOTE
1 - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 - CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.
3 - CROSS REF. TO SHEET NO. IN SAME SCHEM
4 PILOTS ECS LIGHT COMES ON WHEN OVHT LIGHT COMES ON
5 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY

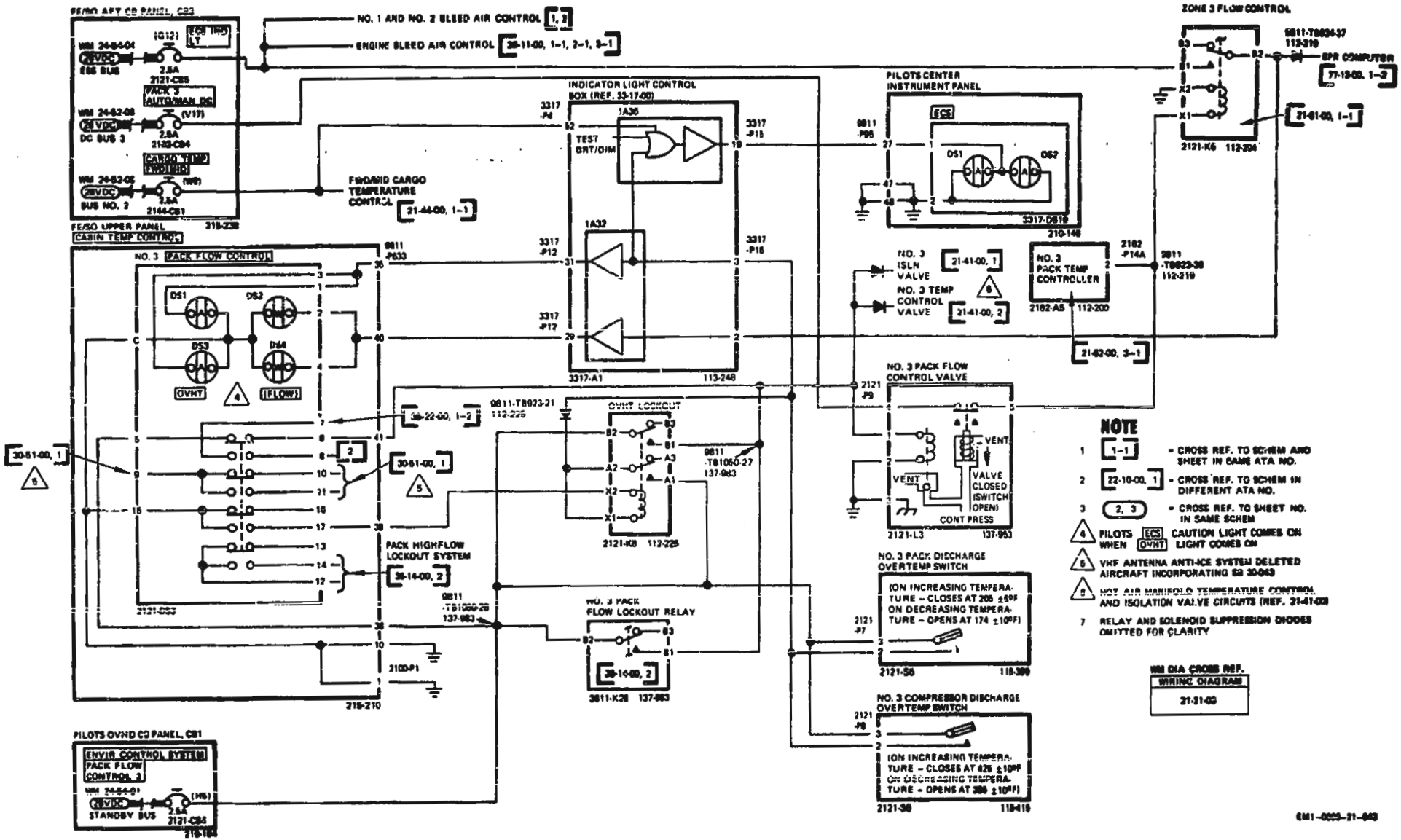
No. 1 Pack Flow Control Schematic
SCHEM 1

EFFECTIVITY: ALL

001B


FE/SO APT CB PANEL, CB3
ENGINE BLEED AIR CONTROL
INDICATOR LIGHT CONTROL BOX (REF 33-17-00)
PILOTS CENTER INSTRUMENT PANEL
ZONE 2 FLOW CONTROL
EPR COMPUTER
FE SO UPPER PANEL
CABIN TEMP CONTROL
NO. 2 PACK FLOW CONTROL
NO. 2 PACK TEMP CONTROLLER
NO. 2 PACK FLOW CONTROL VALVE
ANY OPEN
CLOSED
VENT
VALVE CLOSED (SWITCH OPEN)
CONT. PRESS.
OVHT LOCKOUT
VHF ANTENNA ANTI-ICE
PACK HIGH FLOW LOCKOUT
NO 2 PACK HIGH FLOW LOCKOUT RELAY
ATM PRIORITY CONTROL RELAY
ATM PRIORITY PRESSURE SWITCH
NO 2 PACK DISCHARGE OVERTEMP SWITCH
NO. 2 COMPRESSOR DISCHARGE OVERTEMP SWITCH
ION INCREASING TEMPERATURE · CLOSES AT 205 ±10 °F) ON DECREASING TEMPERATURE-OPENS AT 174 ±10 °F
ION INCREASING TEMPERATURE CLOSES AT 425 ± 10°F ON DECREASING TEMPERATURE · OPENS AT 365 ± 10°F)
PILOTS OVHD CB PANEL, CB1
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 2
STANDBY BUS 28V DC 2A 2121 CB3
ATM CONTROL
ENGINE BLEED AIR SYSTEM
WM DIA CROSS REF.
WIRING DIAGRAM 21-21-02
NOTE:
1 1-1 - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 72-10-00, 1-2 - CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.
3 2, 3 - CROSS REF. TO SHEET NO. IN SAME SCHEM
4 PILOTS ECS CAUTION LIGHT COMES ON WHEN OVHT LIGHT COMES ON
5 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
6 VHF ANTENNA ANTI-ICE SYSTEM DELETED ON AIRCRAFT INCORPORATING S630-043
7 ATM PRIORITY PRESSURE SWITCH OPERATING RANGE
PART NUMBER | CLOSE | OPEN
F73092-101 | 13.0 PSIG ±0.5 | 15.5 PSIG
673092-103 | 15.5 PSIG ±0.5 | 17.0 PSIG
673092-105 | 15.5 PSIG ±0.5 | 20.0 PSIG ±1.0

No. 2 Pack Flow Control Schematic
SCHEM 2


NO. 1 AND NO. 2 BLEED AIR CONTROL
ENGINE BLEED AIR CONTROL
ZONE 3 FLOW CONTROL
EPR COMPUTER
INDICATOR LIGHT CONTROL BOX (REF. 33-17-00)
PILOTS CENTER INSTRUMENT PANEL
FWD/AFD CARGO TEMPERATURE CONTROL
NO. 3 PACK FLOW CONTROL
NO. 3 ISLN VALVE
NO. 3 TEMP CONTROL VALVE
NO. 3 PACK TEMP CONTROLLER
NO. 3 PACK FLOW CONTROL VALVE
OVHT LOCKOUT
PACK HIGHFLOW LOCKOUT SYSTEM
NO. 3 PACK FLOW LOCKOUT RELAY
NO. 3 PACK DISCHARGE OVERTEMP SWITCH
NO. 3 COMPRESSOR DISCHARGE OVERTEMP SWITCH
PILOTS OVHD CB PANEL, CB1
NOTE
WM DIA CROSS REF.
WIRING DIAGRAM
21-21-03

No. 3 Pack Flow Control Schematic
SCHEM 3

R R

PACK FLOW CONTROL VALVE MAINTENANCE PRACTICES

1. General

The three pack flow control valves control entry of air from the pneumatic system into the air conditioning system. Valve No. 1 modulates the flow of air to air cycle pack No. 1. Valves No. 2 and No. 3 modulate airflow to air cycle packs No. 2 and No. 3, respectively, and to the hot air manifold system (Ref. 21-41-00) through valves in that system.

Access to the valves is through doors 192H and 137AZ and through hinged floor panels in the mid electrical service center, zone 137.

R R On aircraft 001-031, access to valve No. 1 is through hinged floor panel 137AB.

R R On aircraft 032-999, access to valve No. 1 is through hinged floor panel 137FB.

Access to valve No. 2 is through hinged floor panel 137BB.

R Access to valve No. 3 is through hinged floor panel 137CB.

2. Maintenance Practices

A. Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

R R R R R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

R (2) Open mid electrical service center floor access panel.

R R R R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

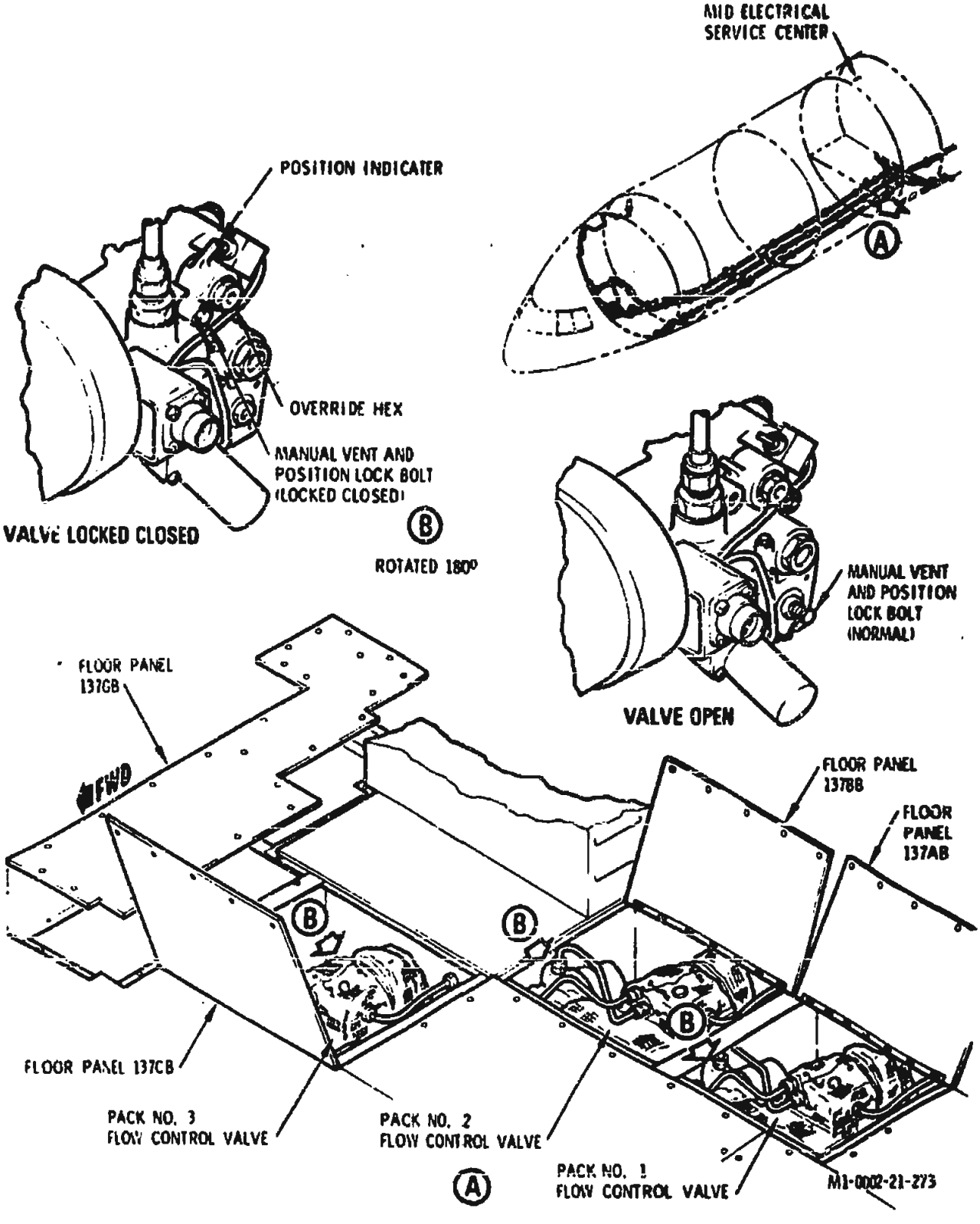
(3) Locate manual override hex and manual vent lock bolt on valve (Ref. Fig. 201), remove manual vent lock bolt from its normal position.

(4) Using a 1/2-inch wrench on override hex, manually
R rotate valve shaft clockwise until hole in the manual
R override lever is positioned over and in alignment with
R the mating hole in the valve body.

R (5) Lock valve in closed position by screwing captive vent bolt into threaded hole.

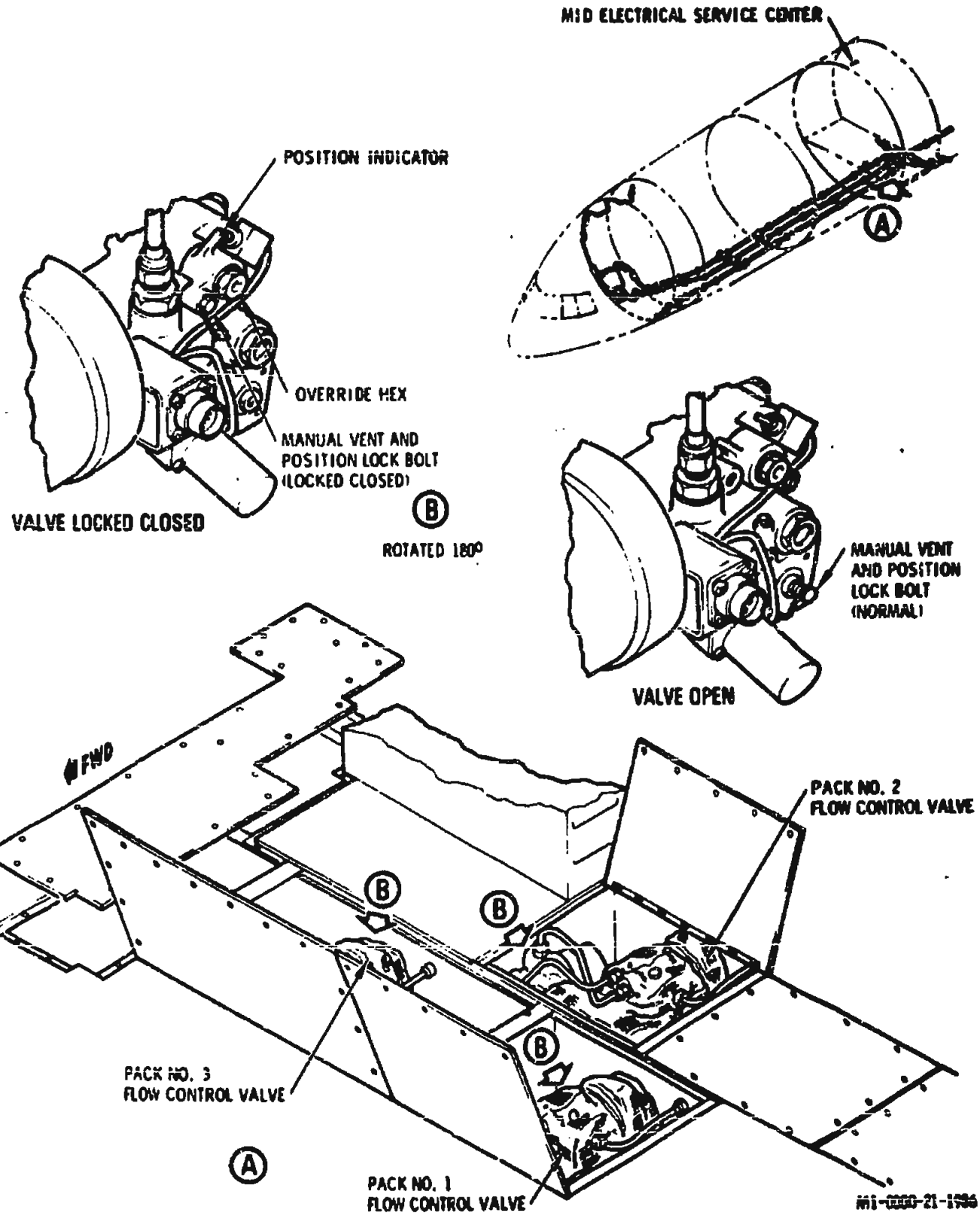
(6) On FE/SO CABIN TEMP CONTROL panel, zone 215, placard applicable PACK FLOW CONTROL switchlight PACK FLOW CONTROL VALVE INOPERATIVE.

(7) Make appropriate entry in aircraft log book.



R Pack Flow Control Valve - Deactivation
R Figure 201 (Sheet 1)

R EFFECTIVITY: 001-031



R R Pack Flow Control Valve - Deactivation
Figure 201 (Sheet 2)

R EFFECTIVITY: 032-999

PACK FLOW CONTROL VALVE - REMOVAL AND INSTALLATION

1. General

The three pack flow control valves are below the floor of the mid electrical service center (MESC). Each valve controls air flow from the crossbleed manifold (Ref. 36-00-00) to one of the three air cycle systems (Ref. 21-51-00). The No. 2 system pack flow control valve is on BL 00 and the No. 1 and No. 3 system valves are on BL 21.1 left and right, respectively.

On aircraft 001-031,
access to valve No. 1 is through hinged floor panel 137AB.

On aircraft 032-999,
access to valve No. 1 is through hinged floor panel 137FB.

Access to valve No. 2 is through hinged floor panel 137BB.

Access to valve No. 3 is through hinged floor panels 137CB and 137JB.

TABLE 401

PARAGRAPH	REMOVAL AND INSTALLATION PROCEDURE
4	Pack Flow Control Valve
5	Valve Position Switch
6	Valve Flow Sensor Filter
7	Valve Elbow Filter
8	Valve Actuator Filter

2. Equipment and Materials

Pack Flow Control Valve:

Protective plugs and caps

R Preformed Packing, MS9385-06

Lockwire, Fed Spec QQ-W-390, 0.020-inch diameter, or equivalent

R Valve Position Switch:

Contact Removal/Installation Tool, NAS 1664-20, Cannon No. CIET-20, Deutsch No. M15570-20, MS24256A-20, or equivalent

Connector pins (2), MS 24254-20P, or equivalent

R Crimping Tool, MS3191-1, or equivalent

Actuator Filter:

R Filter Element (internal filter)

R Filter Element (external filter)

R Lockwire, Fed Spec QQ-W-390, 0.020-inch diameter, or equivalent

Flow Sensor Filter:

R Filter Element

Lockwire, Fed Spec QQ-W-390, 0.020-inch diameter, or equivalent

R Elbow Filter:

R Preformed Packing

3. Referenced Procedures

20-00-06	Safetying Practices
20-24-02	Crimped Electrical Contact - Removal and Installation
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
24-00-00	Electrical Power - Maintenance Practices

4. Removal/Installation - Pack Flow Control Valve

A. Removal

NOTE: Removal and Installation of the pack flow control valve is best accomplished when all components in that system are at ambient air temperature. If

procedure must be accomplished when components are above ambient, the replacement valve must be installed immediately after valve removal to avoid elongation of space between duct ends due to ducts cooling.

(1) Tag flight Engineer/Second Officers (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of pneumatic system until completion of procedures.

(2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag applicable circuit breaker:

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4), or

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5).

On FE/SO aft circuit breaker panel CB3, zone 215, open and tag applicable circuit breaker:

PACK 1 - AUTO/MAN - DC (V5),

PACK 2 - AUTO/MAN - DC (V7), or

PACK 3 - AUTO/MAN - DC (V17)

(3) In MESC, open applicable hinged floor panel.

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

(4) Disconnect altitude ambient pressure tube from valve fitting.

C (5) Deleted.

(6) Install protective plugs in tube end fitting and in valve port.

(7) Disconnect electrical cable connector from valve receptacle.

(8) Install protective caps on connector and receptacle and
C stow cable to prevent damage, and in fitting end on
C valve.

(9) Support valve and remove single T-bolt V-band couplings at each end of valve (Ref. 20-36-01). Slide couplings back onto ducts.

(10) On aircraft 001-031 with SB21-214, when removing No. 3 valve, remove floor stiffener above forward valve clamp by removing screws attaching stiffener to brackets.

CAUTION: WHEN REMOVING NO. 3 PACK FLOW CONTROL VALVE AVOID CONTACT WITH GALLEY FEEDER CABLE UNDERNEATH MESC RH REMOTE CONTROL CIRCUIT BREAKER PANEL.

(11) Remove valve by sliding from between duct ends.

(12) Install protective caps on exposed ends of ducts and valve.

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(3) Remove protective caps from valve and ducts and inspect to verify mating surfaces are clean and undamaged.

(4) Verify single T-bolt V-band couplings are on duct ends forward and aft of valve position.

(5) Slide valve into position between duct ends and install couplings (Ref. 20-36-01). Do not tighten couplings.

C (6) Install Deleted.

(7) Remove protective plug from altitude ambient pressure
C port on valve.

(8) Remove protective plug from altitude ambient pressure tube, rotate valve to obtain proper alignment, and
C connect tube to fitting.

(9) Torque single T-bolt V-band couplings (Ref. 20-36-01).

(10) Remove protective caps and connect electrical cable connector to valve receptacle.

(11) On aircraft 001-031 with SB21-214, if No. 3 valve was removed, install floor stiffener above forward valve clamp.

(12) Remove tag and close circuit breakers opened in Step 4A(2).

(13) Remove tags installed in Step 4A(1).

(14) Operate applicable Air Cycle System (Ref. 21-00-00). Check all disturbed connections for leaks and pack flow control valve for proper operation.

(15) Close hinged floor panel over valve.

5. Removal/Installation - Valve Position Switch

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of pneumatic system until completion of procedures.

(2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag applicable circuit breaker:

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3)

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4)

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5)

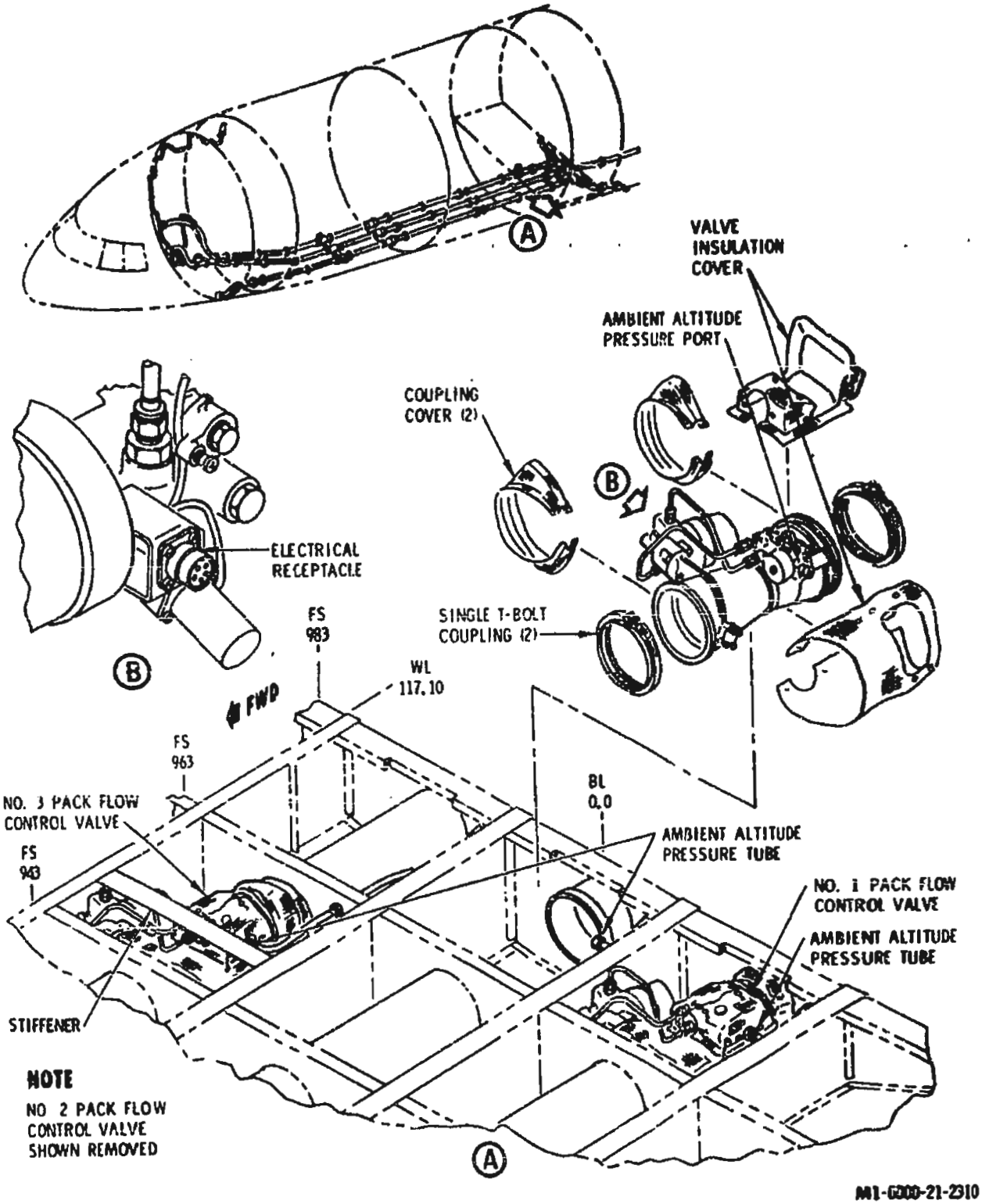
On FE/SO aft circuit breaker panel CB3, zone 215, open and tag applicable circuit breaker:

PACK 1 - AUTO/MAN - DC (V5)

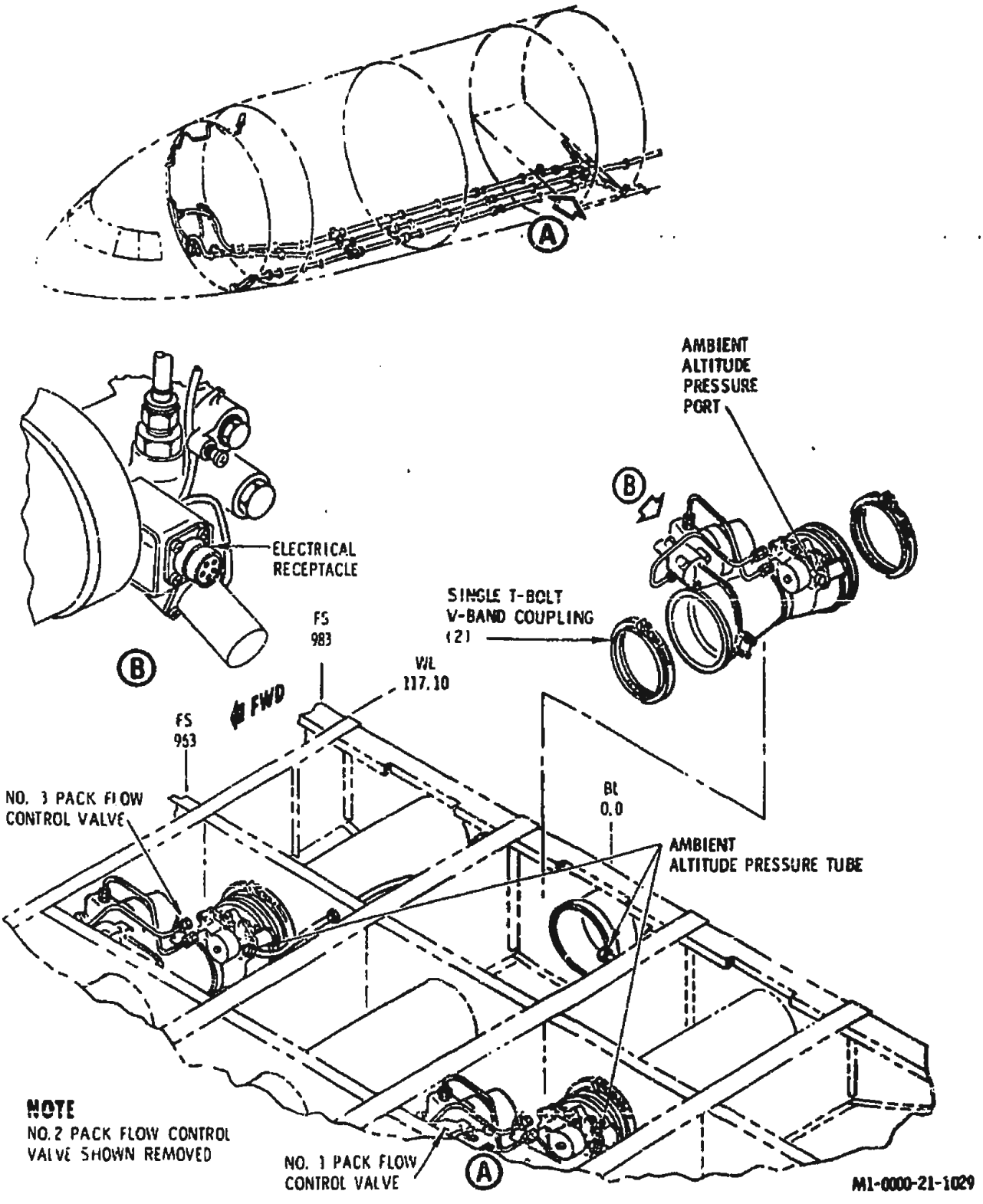
PACK 2 - AUTO/MAN - DC (V7)

PACK 3 - AUTO/MAN - DC (V17)

(3) In MESC, open applicable hinged floor panel.



R Pack Flow Control Valves - Removal and Installation
R Figure 401



R Pack Flow Control Valves - Removal and Installation
R Figure 401

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

(4) Disconnect electrical cable connector from valve.

(5) Remove nut securing switch to integral bracket on top of valve, and remove switch and washer (Ref. Fig. 402).

(6) Leave enough wires to allow splicing of switch wires without removal of connector.

(7) Unless floor boards are removed, it may be necessary to disconnect Pack Flow Control Valve No. 3 ambient sense line (Ref. Fig. 401), loosen clamps and rotate valve to gain access to switch and wires.

(8) Remove screws securing electrical receptacle bracket to valve.

(9) Remove nuts, washers, and screws to separate receptacle from bracket.

(10) Loosen clamp holding switch wires to valve and move wires from under clamp.

(11) Loosen wire clamp screws on receptacle backshell and unscrew backshell from receptacle.

(12) Use contact removal/installation tool to remove switch wires and crimped pins from receptacle positions 4 and 5 (Ref. 20-24-02).

(13) Remove sleeving from switch wires for reuse on new switch wires, measure and record length of wires on old switch.

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Verify that circuit breakers opened in Step 5A(2) are open and tagged.

(3) Cut wires on new switch to same length as on old switch, and use crimping tool to install connector pins on wires.

(4) Install sleeving on new switch wires.

(5) Slide switch wires, in sleeving, through connector backshell and use contact removal/installation tool to install switch wires crimped pins in receptacle, positions 4 and 5 (Ref. 20-24-02).

(6) Install backshell on receptacle and tighten wire clamp screws.

(7) Install screws, washers, and nuts securing receptacle to bracket and screws securing bracket to valve.

(8) Install switch in bracket on top of valve (Ref. Fig. 402) with 2 to 3 threads exposed between jamnut and switch case.

(9) Connect ohmmeter to pins 4 and 5 of receptacle. Infinite resistance must be obtained (open circuit) with valve closed and switch actuated.

(10) With 1/2-inch wrench, manually move valve toward open position and observe ohmmeter. Continuity between pins 4 and 5 must be obtained as valve leaves closed position.

(11) Return valve to closed position.

(12) Connect electrical cable connector to valve receptacle.

(13) Remove tags and close circuit breakers opened in Step 5A(2).

(14) Turn on electrical power (Ref. 24-00-00)

(15) On Flight Engineer/Second Officers ENGINE BLEED CONTROL/CABIN TEMP CONTROL panel, observe PACK FLOW CONTROL switchlights:

(a) With pack flow control valves closed, all three switchlight flowbars must be off.

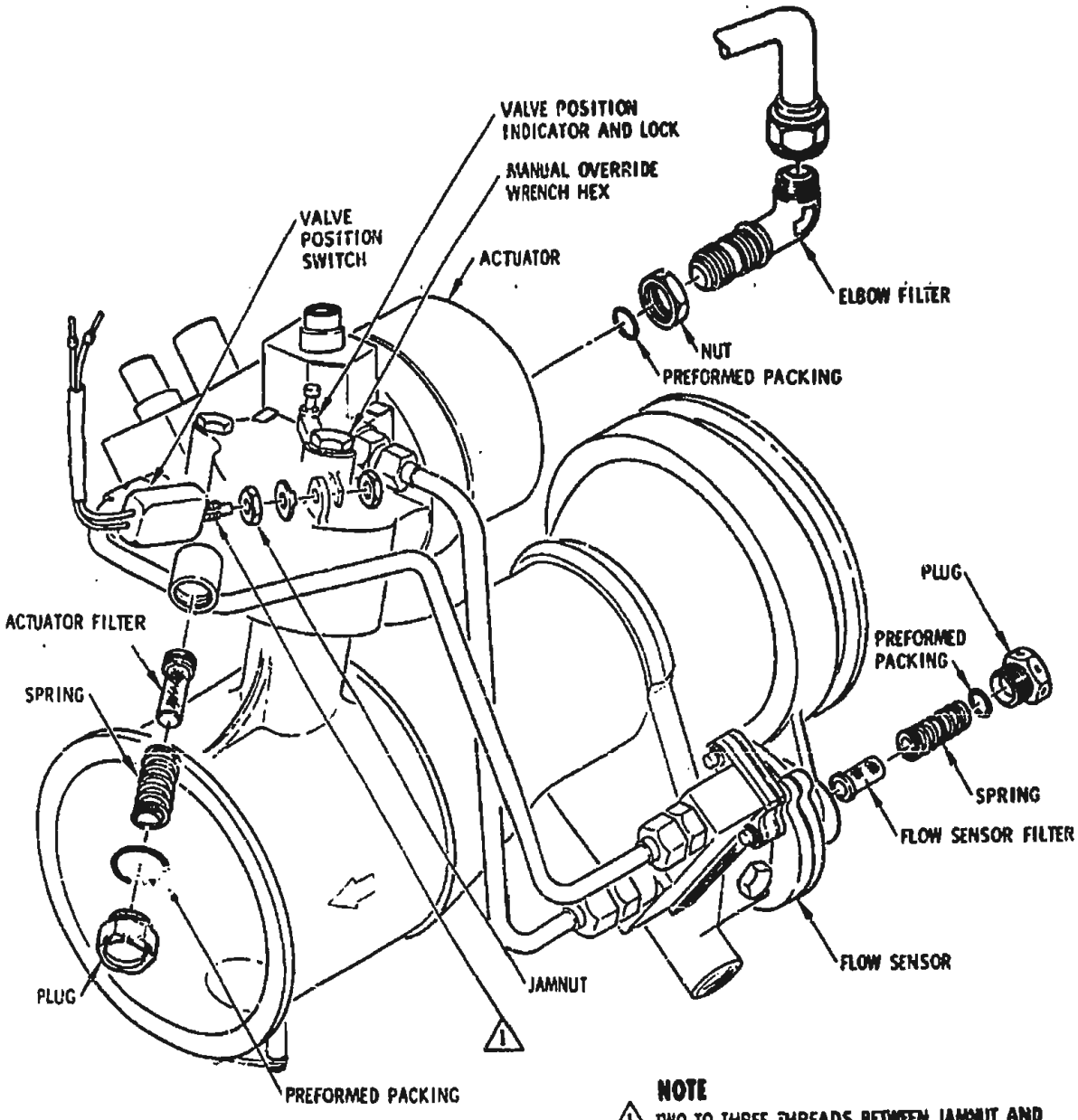
(b) Manually open applicable pack flow control valve; applicable switchlight flow bar must come on.

(c) Return valve to closed position; flow bar must go off.

(16) Close hinged floor panel.

(17) Remove tags installed in Step 5A(1).

(18) Turn off electrical power (Ref. 24-00-00).



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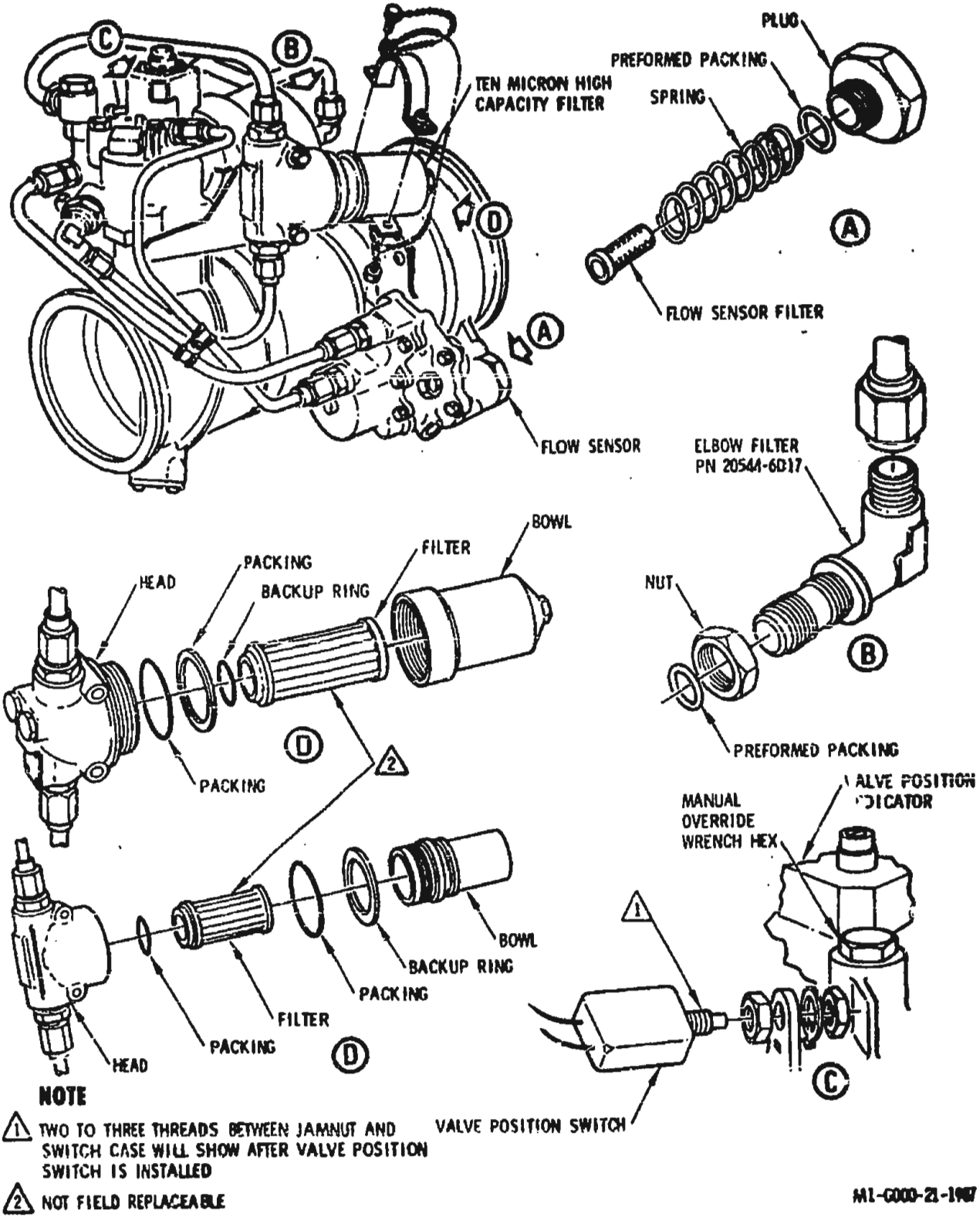
R Pack Flow Control Valve Filters and Position Switch
R Removal and Installation
R Figure 402

EFFECTIVITY: WITHOUT HIGH CAPACITY ACTUATOR FILTER

001B



C Pack Flow Control Valve Filters and Position Switch
C Removal and Installation
C Figure 402

R EFFECTIVITY: WITH HIGH CAPACITY
R ACTUATOR FILTER
001B

6. Removal/Installation - Valve Flow Sensor Filter

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of pneumatic system until completion of procedures.

(2) In MESC, open applicable hinged floor panel.

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

(3) Remove hex plug, preformed packing spring, and filter from valve flow sensor (Ref. Fig. 402).

(4) Inspect preformed packing on plug. If damaged, replace packing.

R

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

CAUTION: THE FILTER MUST BE INSTALLED FLANGED END FIRST (REF. FIG. 402).

(2) Install flow sensor filter (flanged end first) in flow sensor cavity, followed by spring and plug with preformed packing (Ref. Fig. 402).

(3) Inspect preformed packing on plug, if damaged, replace packing.

(4) Tighten and lockwire plug.

(5) Close hinged floor panel.

(6) Remove tags installed in Step 6A(1).

7. Removal/Installation - Valve Elbow Filter

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three

high-pressure ground air connections to prevent operation of pneumatic system until completion of procedures.

(2) In MESC, open applicable hinged floor panel.

(3) Remove elbow filter nut and packing from actuator (Ref. Fig. 402).

R (4) Inspect preformed packing, if damaged replace packing.

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Install packing (Hamilton Standard PN 69494J906) nut and elbow filter. Adjust elbow filter to assemble to sleeve of tube and tighten tube coupling sleeve to elbow. Tighten nut to a 20-25 lb-in. torque.

(3) Close hinged floor panel.

(4) Remove tags installed in Step 7A(1).

8. Removal/Installation - Valve Actuator Filter

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of pneumatic system until completion of procedures.

(2) In MESC, open applicable hinged floor panel.

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

(3) On valve without external actuator filter:

(a) Remove hex plug, preformed packing, spring, and filter from actuator (Ref. Fig. 402).

(b) Inspect preformed packing on plug.

R (c) If damaged, replace packing.

(3) On valve with external actuator filter:

(a) Remove lockwire and clamp from the filter cover (bowl), unscrew bowl from the valve body and remove bowl with filter, backup ring bowl preformed packing and filter preformed packing.

C C (b) Remove filter from bowl (Ref. Fig. 402). (Not Field Replaceable)

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) On valve without external actuator filter:

(a) Install actuator filter (flanged end first) in actuator cavity, followed by spring and plug with preformed packing.

(b) Tighten and lockwire plug (Ref. Fig. 402).

(2) On valve with external actuator filter:

(a) Insert filter element into bowl (flat end first).

(b) Install smaller preformed packing on the filter end.

(c) Also install backup ring and larger preformed packing on the bowl. Install bowl with filter on the head.

(d) Tighten bowl to a maximum torque of 20 lb-inch.

(e) Install clamp with chains and retainers on the filter bowl assembly and retain with two screws, tightening screws to 15-20 lb-inch above running torque.

(3) close hinged floor panel.

(4) Remove tags installed in Step 8A(1).

PACK FLOW CONTROL VALVE - ADJUSTMENT AND TEST

1. General

The three pack flow control valves may be tested on the aircraft by using an external pressure source. Satisfactory completion of the test verifies operation of the shutoff solenoid, actuator, excess flow shutoff, and position limit switch. Adjustments cannot be made on the aircraft. If adjustment is required, the valve must be removed and sent to a shop with suitable pneumatic test equipment.

2. Equipment and Materials

Valve Tester, Hamilton Standard PN GS9400-7, or equivalent

Test Plug, Hamilton Standard PN GS14111-1, or GS14123-1 or equivalent

Test Plug, Hamilton Standard PN GS 14122-1, or equivalent

Preformed Packing, Hamilton Standard PN 69494J904, or equivalent for test port G1 and 69494J905 or equivalent for test port G2

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Adjustment/Test

A. Functional Test

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED
R CONTROL and APU CONTROL panels and the three
R high-pressure ground air connections to prevent
R operation of the pneumatic system until completion of
R procedures.

R (2) Gain access to mid electrical service center (MESC).

R (3) On aircraft 001-031,
R open hinged floor panel 137AB for valve No. 1, panel
R 137BB for valve No. 2, or panel 137CB for valve No. 3.

R (3) On aircraft 032-999, open hinged floor panel 137FB for valve No. 1, panel 137BB for valve No. 2, or panel 137CB for valve No. 3.

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

R (4) Remove ground test plugs from ports G1 and G2 (Ref. Fig. 501).

R (5) Install test plug GS14111-1, or 14123-1 or equivalent, in port G1, and test plug GS14122-1, or equivalent, in port G2.

R (6) Connect tester to valve, using directions supplied with tester.

R (7) On Flight Engineer/Second Officers (FE/SO) ENGINE BLEED CONTROL panel, zone 215, ensure that associated PACK FLOW CONTROL switchlight is depressed (latched in).

R (8) Apply 9 psig air pressure to port G1.

R (9) Verify valve opens and flowbar in PACK FLOW CONTROL switchlight comes on.

R (10) Apply 5 psig air pressure to port G2.

R (11) Verify valve closes and flowbar in switchlight must go off.

R (12) Remove pressure from port G2 and verify valve reopens.

R (13) Energize close solenoid by releasing PACK FLOW CONTROL switchlight and verify valve closes.

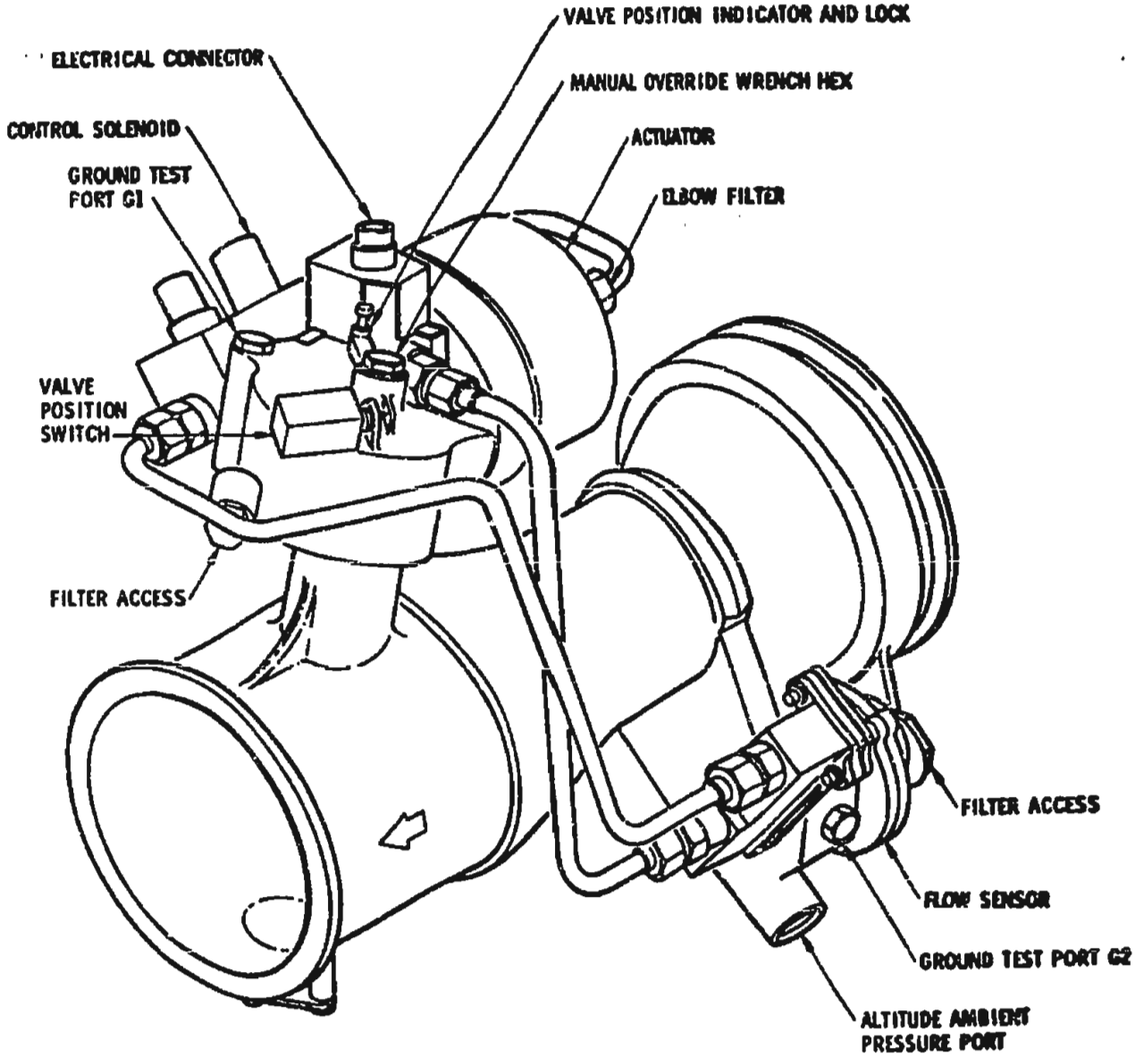
R (14) Remove pressure from port G1.

R (15) Remove test plugs and reinstall ground test plugs (Ref. Fig. 501) using new preformed packings PN 69494J904 in Port G1 and PN 69494J905 in port G2.

R (16) Torque plug in port G1 20 to 25 lb in. and lock-wire.

R (17) Torque plug in port G2 25 to 30 lb in. and lock-wire.

R (18) Remove tags installed in Step 4A(1).



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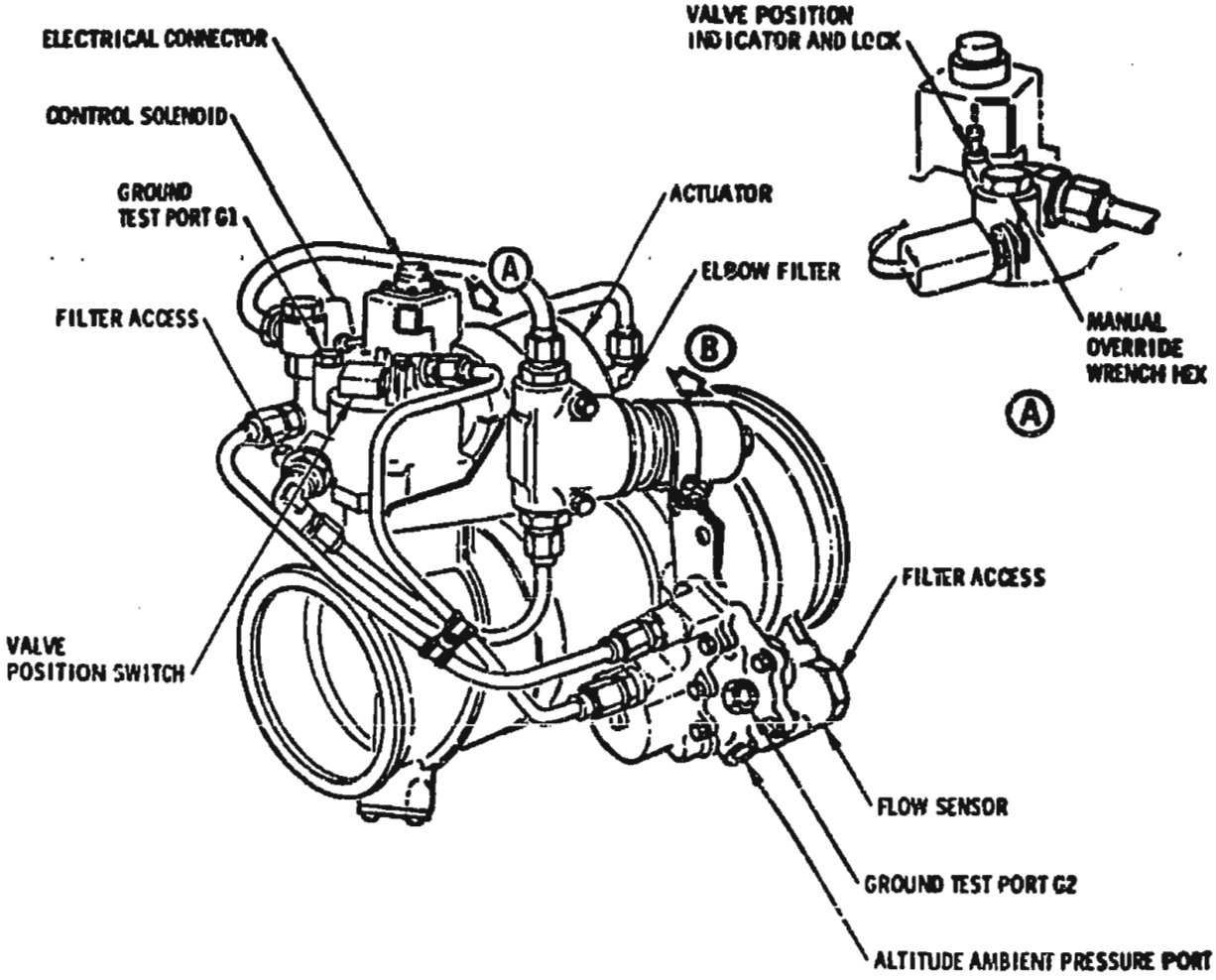
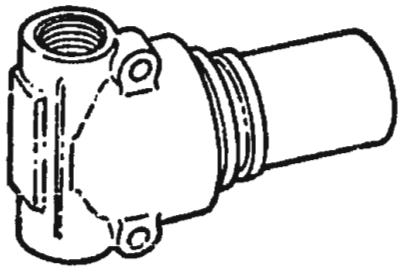
R
R

Pack Flow Control Valve
Figure 501

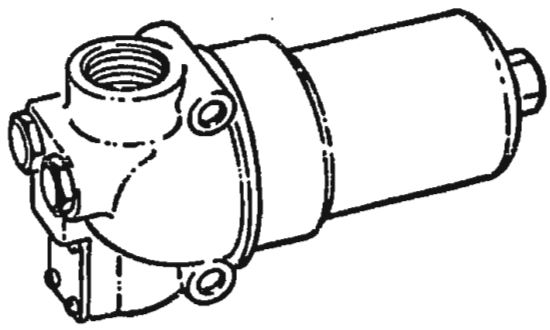
EFFECTIVITY: WITHOUT HIGH CAPACITY ACTUATOR FILTER

0018





B
BENDIX FILTER



B
PURALATOR FILTER

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R
R Pack Flow Control Valve
Figure 501

R EFFECTIVITY: WITH HIGH CAPACITY ACTUATOR
R FILTER
0018

R # DUCT COMPENSATOR - MAINTENANCE PRACTICES

R 1. General

R The duct compensators may retain residual oil from engine or APU
R leakage. The residual oil can be eliminated by heat (Ref.
R 36-00-00), but will most effectively be eliminated by removal
R and cleaning of duct compensators.

R This procedure provides instruction for cleaning residual oil
R from duct compensators.

R 2. Equipment and Materials

R Methyl-Ethyl-Keytone - TT-M-261 or equivalent

R Clean, lint free cloth

R 3. Referenced Procedures

R	21-00-00	Air Conditioning System - Maintenance Practices
R	21-21-05	Duct Compensator - Removal and Installation
R	21-21-05	Stainless Steel Products Inc. Overhaul Manual (FSCM 98769)
R	36-00-00	Pneumatic and ECS Ducting - Cleaning Procedure

R 4. Maintenance Practices

R A. Removal

R (1) Perform the following Steps to determine which duct
R compensator is contaminated:

R (a) Operate each ECS pack individually (Ref.
R 21-21-00). During operation of each pack, check
R cabin for oil fumes.

R (b) If oil fumes are present during operation of ECS
R pack No. 1, duct compensator No. 1 is
R comtaminated. The same applies for ECS packs No.
R 2 and No. 3 and their respective duct compensators
R No. 2 and No. 3.

R (2) Remove contaminated duct compensator (Ref. 21-21-05).

R B. Cleaning

WARNING: USE SOLVENT IN A WELL VENTILATED AREA AND WITH PROPER PRECAUTIONS TO PREVENT FIRE. AVOID BREATHING OF FUMES AND EXCESSIVE CONTACT WITH SKIN. WEAR GOGGLES WHEN USING COMPRESSED AIR TO DRY PARTS.

(1) Clean residual oil out of duct compensator using methyl-ethyl-keytone (Fed. Spec. TT-M-261, or equivalent).

(2) Dry with clean, lint free cloth or with dry compressed air at 20 psig maximum pressure.

NOTE: If further cleaning is required, disassemble and clean in accordance with Stainless Steel Products Overhaul Manual 21-21-05.

C. Installation

(1) Install duct compensator (Ref. 21-21-05).

DUCT COMPENSATOR - REMOVAL AND INSTALLATION

1. General

Three identical compensators in the supply systems are located below the forward cargo floor. Access to the No. 1 system compensator is through access panel 124NT, for No. 2 through 124NT and 124PT, and for No. 3 through 124PT. Ball mat assemblies over these floor panels are those between FS649 and FS 689.

2. Equipment and Materials

Protective caps

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

6-50-00	Interior Floor Panel
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
25-52-04	Ball Mat Assembly - Removal and Installation

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

R (2) Remove ball mat and cargo floor access panel over applicable duct compensator (Ref. 25-52-04 and Ref. 6-50-00).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN NECESSARY.

R (3) Remove supports on bleed air overheat sensors from left and right sides of duct compensator, and move sensors gently aside to prevent damage to sensors.

R (4) Remove preformed insulation retaining wire and insulation cover from both ends of compensator (Ref. Fig. 401).

R (5) Support compensator, remove single T-bolt V-band couplings from both ends of compensator (Ref. 20-36-01), and remove compensator.

R (6) Install protective caps on duct openings.

B. Installation

R (1) Verify tags previously installed on FE/SO ENGINE BLEED
R CONTROL and APU CONTROL panels and the three
R high-pressure ground air connections are in place.

R (2) Remove protective caps from duct openings.

R (3) Telescope (extend or retract) compensator to needed length, position duct compensator between duct ends, and install single T-bolt V-band coupling over compensator and duct joint at each end of the compensator (Ref. 20-36-01).

R (4) Install preformed insulation covers and insulation retaining wire.

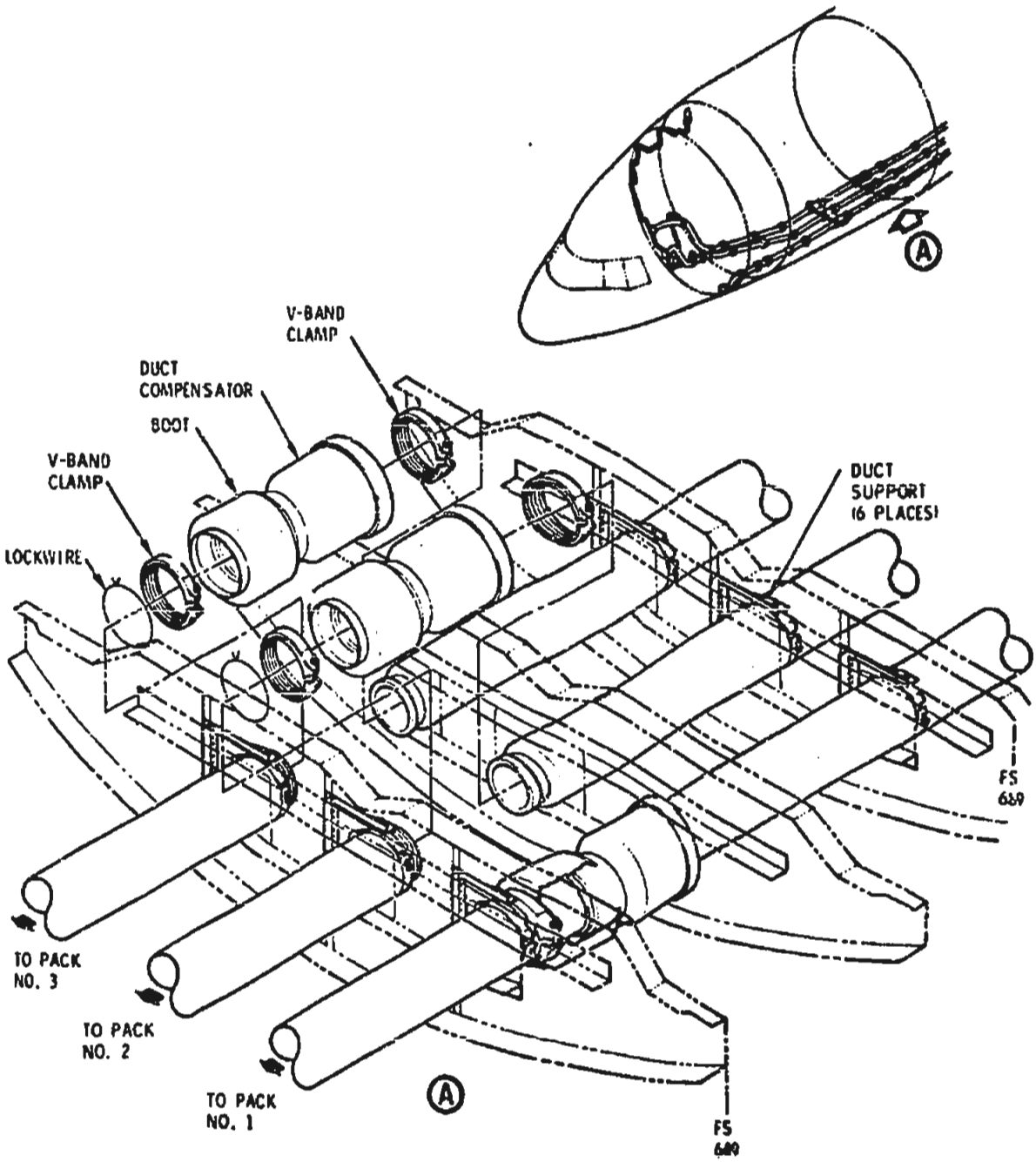
NOTE: Ensure that insulation covers (boots) fully cover the V-band couplings (Ref. Fig. 401).

R (5) Gently move overheat sensors into position and install sensor supports on both sides of compensator.

R (6) Remove tags installed in Step 4.

R (7) Operate applicable Air Cycle System (Ref. 21-00-00). Check all disturbed connections for leakage.

R (8) Install floor access panel (s) and ball mat assembly (Ref. 6-50-00 and Ref. 25-52-04).



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M1-0001-21-207

R
R
R

Duct Compensator
Removal and Installation
Figure 401

EFFECTIVITY: ALL

0018

PACK DUCT PRESSURE SEAL - REMOVAL AND INSTALLATION

1. General

The three pack duct pressure seals are installed on the pressure bulkhead between the forward cargo compartment and the environment control system (ECS) compartment. One for each of the pack supply ducts. Pack number 1 is in the left ECS compartment, zone 117. Pack number 2 and 3 are in the right ECS compartment, zone 118. Removal and installation procedures are the same except for the access panel references.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

6-40-00	Exterior Access Door and Panels, Zone 100
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System

4. Removal/Installation

R
R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED (FE/SO) AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVE SHOULD BE USED WHEN REQUIRED.

A. Removal

(1) For access to pack number 1 duct pressure seal, open the left ECS compartment door 117AL. For access to pack number 2 and 3 duct pressure seals, open the right ECS compartment door 118CR.

(2) Remove cover over T-bolt coupling over both ends of duct (Ref. Fig. 401).

(3) On pack number 2 and 3 the ducts "T" into the hot manifold through the hot manifold temperature control valves. Remove T-bolt coupling on control valve and remove mounting screw connecting control valve to duct.

(4) Remove T-bolt coupling from bleed air duct (Ref. 20-36-01).

NOTE: Care should be taken to prevent damage to the loop sensor (Ref. 36-22-00).

R (5) On pack number 1,
R remove bolt from duct support brace (peculiar to pack 1
R only).

(6) Remove duct and install protective caps.

(7) Remove the 2 clamps on duct pressure seal.

(8) Work duct pressure seal forward off of duct.

B. Installation

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Work duct pressure seal on duct with small end forward.

(2) Install the 2 clamps on the duct pressure seal.

(3) Remove protective caps from ducting and wipe mating surfaces clean. Verify duct flanges are undamaged. Repair or replace as necessary.

(4) Install duct with T-bolt coupling on both ends of duct.

R (5) On pack number 2 and 3,
R install T-bolt coupling connecting duct to hot manifold
R temperature control valve. Install mounting screw.

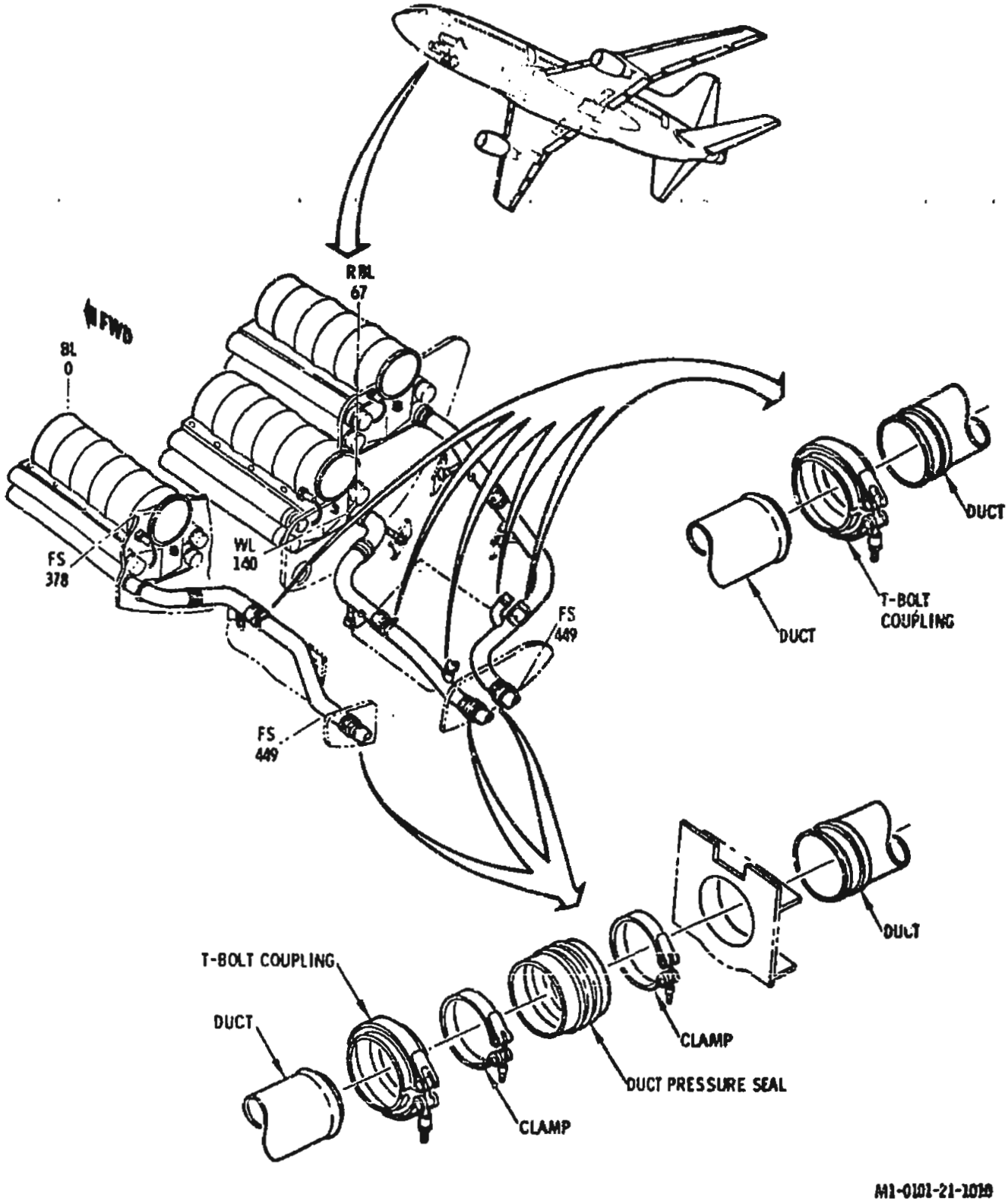
R (6) On pack number 1,
R install bolt in duct support brace (peculiar to pack 1
R only).

(7) Operate ECS pack and check for leakage (Ref. 21-00-00).

(8) Install covers over T-bolt coupling.

(9) Close ECS compartment door.

(10) Remove WARNING tags from FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections.



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R
R Pack Duct Pressure Seal - Removal and Installation
Figure 401

EFFECTIVITY: ALL

001B

R
R

PRECONDITIONED GROUND AIR CONNECTOR REMOVAL AND INSTALLATION

1. General

The two precondition ground air connections are provided to allow standard 8-inch low-pressure ground air supply hoses to be connected externally to the aircraft when pneumatic system high-pressure air supply is not available (Ref. 36-00-00). The two connections are located on lower forward fuselage, behind two quick-latching hinged doors, Zone 118 (Ref. Fig. 401). Removal and installation procedures are the same for both preconditioned ground air connectors.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels, Zone 100
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation

R A. Removal

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED
R CONTROL and APU CONTROL panels and the three
R high-pressure ground air connections to prevent
R operation of the pneumatic system until completion of
R procedures.

R (2) Open ECS compartment door (118 CR) (Ref. 6-40-00).

NOTE: Removal of duct outboard of preconditioned ground air connector will facilitate removal.

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN
R NECESSARY.

R R (3) Remove 2 single T-bolt clamps from duct seal (Ref. 20-36-01).

R (4) Remove pneumatic coupling flexible seal.

R R (5) Open ground air conditioning receptacle cover (118 AB Forward; 118BB Aft).

R R (6) Drill out mounting rivets from preconditioned ground air connector.

R R (7) Remove preconditioned ground air connector from aircraft through ECS compartment door.

R (8) Install protective cap on preconditioned ground air ducting.

B. Installation

R R R (1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

R (2) Remove protective cap from ducting, wipe mating surfaces clean, and verify duct and preconditioned ground air connector flanges are undamaged. Repair or replace as necessary.

R (3) Install, line up and rivet, using existing rivet pattern, the preconditioned ground air connector in place.

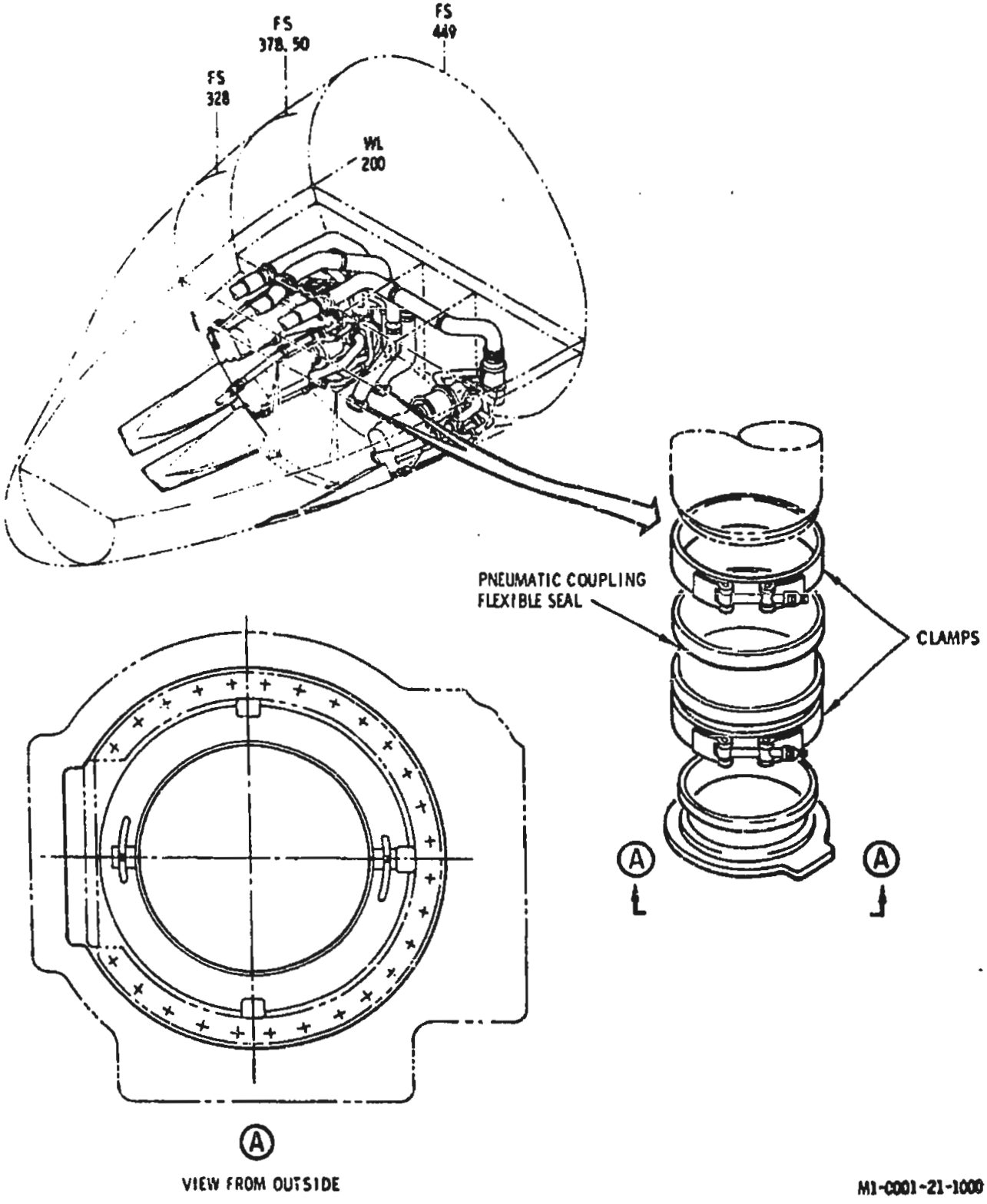
R (4) Install duct pneumatic coupling flexible seal in place.

R (5) Install 2 single T-bolt clamps on duct seal.

NOTE: Reinstall any ducts removed to facilitate removal of preconditioned ground air connector. Check air conditioning system for leaks (Ref. 21-00-00).

R R (6) Close ECS compartment door and ground air conditioning receptacle cover.

R (7) Remove tags installed in the WARNING of Step 4A(1).



R Preconditioned Ground Air Connector - Removal and Installation
R Figure 401

R # BLEED AIR DUCTS FS449-FS983 - REMOVAL AND INSTALLATION

R 1. General

R Bleed air from Engine Number 1, 2, 3 and Auxiliary Power Unit is routed through insulated titanium ducts from the Crossbleed Manifold aft of the FS983 pressurized bulkhead and forward through the pressurized bulkhead at FS449 to the heat exchangers (Ref. Fig. 401). The ducts are routed underneath the floor and supported by cross-ship beams, vertical supports and clamps.

R Removal of any one section of duct in the run between FS449 and FS983 requires the removal of the floor area over the affected duct(s), any duct installed aft of the affected duct, associated Duct Overheat Sensors, any component installed in the duct run such as the associated Heat Exchanger, Duct Compensator, Flow Control Valve, and the associated Crossbleed Manifold T-Fitting. The affected duct and any duct installed aft is then maneuvered through the pressure bulkhead at FS983, past the space when the T-fitting was removed from the Crossbleed Manifold and into the wing box area. Movement of the duct is continued aft into the wing box area and removed from the aircraft through Forward Hydraulic Service Center Access Panel 147AB. Installation of the bleed air duct(s) and restoring the system to normal is the reverse of the removal procedure.

R The duct system is checked for integrity prior to replacing the floor assemblies by applying ground, engine, or APU bleed air.

R 2. Referenced Procedures

R	6-40-00	Exterior Access Doors and Removable Panels - Description and Operation
R	6-50-00	Interior Access Doors and Removable Panels - Description and Operation
R	20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
R	21-00-00	Air Conditioning - Maintenance Practices
R	21-21-01	Pack Flow Control Valve - Removal and Installation
R	21-21-05	Duct Compensator - Removal and Installation
R	21-21-36	ECS Supply Bleed Air Cleaner - Removal and Installation

R R	21-21-37	Ozone Catalytic Converter - Removal and Installation
R R	21-44-01	Forward Cargo Compartment Heat Exchanger - Removal and Installation
R	25-52-04	Ball Mat Assembly - Removal and Installation
R R	25-52-06	Drive Assembly (Self-Lifting Drive) - Removal and Installation
R R	25-52-07	Drive Assembly (Fixed Drive) - Removal and Installation
R R	25-52-11	Longitudinal Guide/Stop Assembly - Removal and Installation
R R	25-52-12	Center Entry Guide/Stop Assembly - Removal and Installation
R R	25-52-14	Retraction Actuator Assembly - Removal and Installation
R	25-52-32	Guide/Stop Manual Latch - Removal and Installation
R	25-52-56	Transverse Guide Rail - Removal and Installation
R R	25-52-59	Transverse Guide Rail Actuator - Removal and Installation
R	36-00-00	Pneumatic System - Maintenance Practices
R	36-22-02	Area Overheat Sensors - Removal and Installation.

R 3. Removal/Installation - Bleed Air Duct(s), FS449-FS983

R A. Removal

R (1) Install a warning tag on the Flight Engineer/Second R Officer ENGINE BLEED CONTROL and APU CONTROL panels to R prevent system operation.

R (2) Remove the necessary compartment floor panels to expose R the affected bleed air duct. Refer to Para. 2 for R required references.

R WARNING: RECENT OPERATION OF THE AIRCRAFT PNEUMATIC SYSTEM R WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH R DUCT AND COMPONENT TEMPERATURES. USE PROTECTIVE R GLOVES WHEN NECESSARY.

R (3) Remove Area Overheat Sensors on the duct(s) (Ref. 36-22-02). Position sensor wiring off to the side to prevent damage.

R (4) Remove additional compartment floor panels required to expose other ducts and system components that must be removed to provide an egress route aft to the Hydraulic Service Center. Refer to Para. 2 for required references and Figure 401 for component location.

R NOTE: The removal of any duct between FS449 and FS983 requires the removal of the T-fitting section of the Crossbleed Manifold that is in line with the duct(s) to be removed.

R (5) Remove clamps, couplings, seals, vertical supports and other fittings securing the duct(s) in position.

R (6) Referring to Figure 401, remove any system component (Heat Exchanger duct connection, Duct Compensator, or Flow Control Valve) that is in line with the duct(s) to be removed. The T-fitting on the Crossbleed Manifold that is in line with the duct(s) must also be removed.

R (7) Carefully route the duct(s) aft through the FS983 bulkhead (MESC pressurized bulkhead) and in to the wing box area.

R (8) Maneuver the duct(s) aft from the wing box area in to the forward Hydraulic Service Center area. Note that the duct(s) may require a forward alignment maneuver in the wing box area prior to moving aft to the Hydraulic Service Center area.

R (9) Remove the duct(s) from the aircraft through the Hydraulic Service Center Access Panel 147AB (Ref. 6-40-00).

R NOTE: If several bleed air ducts were removed from the aircraft to provide an egress path for the faulty duct, number the ducts in numerical sequence as they are removed to avoid confusion during installation.

R B. Installation

R (1) Carefully route the bleed air duct into the aircraft through the Forward Hydraulic Service Center Access Panel 147A.

R NOTE: If ducts other than the one to be replaced were removed, ensure that the last duct removed in

R Para. 3A is the first one to be installed (Ref.
R Fig. 401).

R (2) Maneuver the duct forward into the wing box area, past
R the Crossbleed Manifold, FS983 pressure bulkhead to the
R installation station.

R (3) Move the duct up to the aft end of the installed duct
R or system component (Heat Exchanger, Duct Compensator
R or Flow Control Valve) and secure in position with
R required seals, clamps and support brackets (Ref. Fig.
R 401). Refer to Para. 2 for required procedures.

R (4) If additional ducts are to be installed, repeat Steps
R (1) through (3) until the entire duct system is
R restored to the original configuration (Ref. Fig. 401).

R (5) Install and reconnect the Duct Overheat Sensors (Ref.
R 36-22-02).

R (6) Inspect the entire working area and remove all tools
R and other objects.

R (7) Remove the warning tags from the FE/SO ENGINE BLEED
R CONTROL and APU CONTROL panels.

R WARNING: APPLICATION OF BLEED AIR TO CHECK THE SYSTEM
R INTEGRITY WILL RESULT IN DANGEROUSLY HIGH DUCT AND
R COMPONENT TEMPERATURES. USE PROTECTIVE GLOVES.

R (8) Apply ground, engine or APU bleed air to the repaired
R system (Ref. 36-00-00).

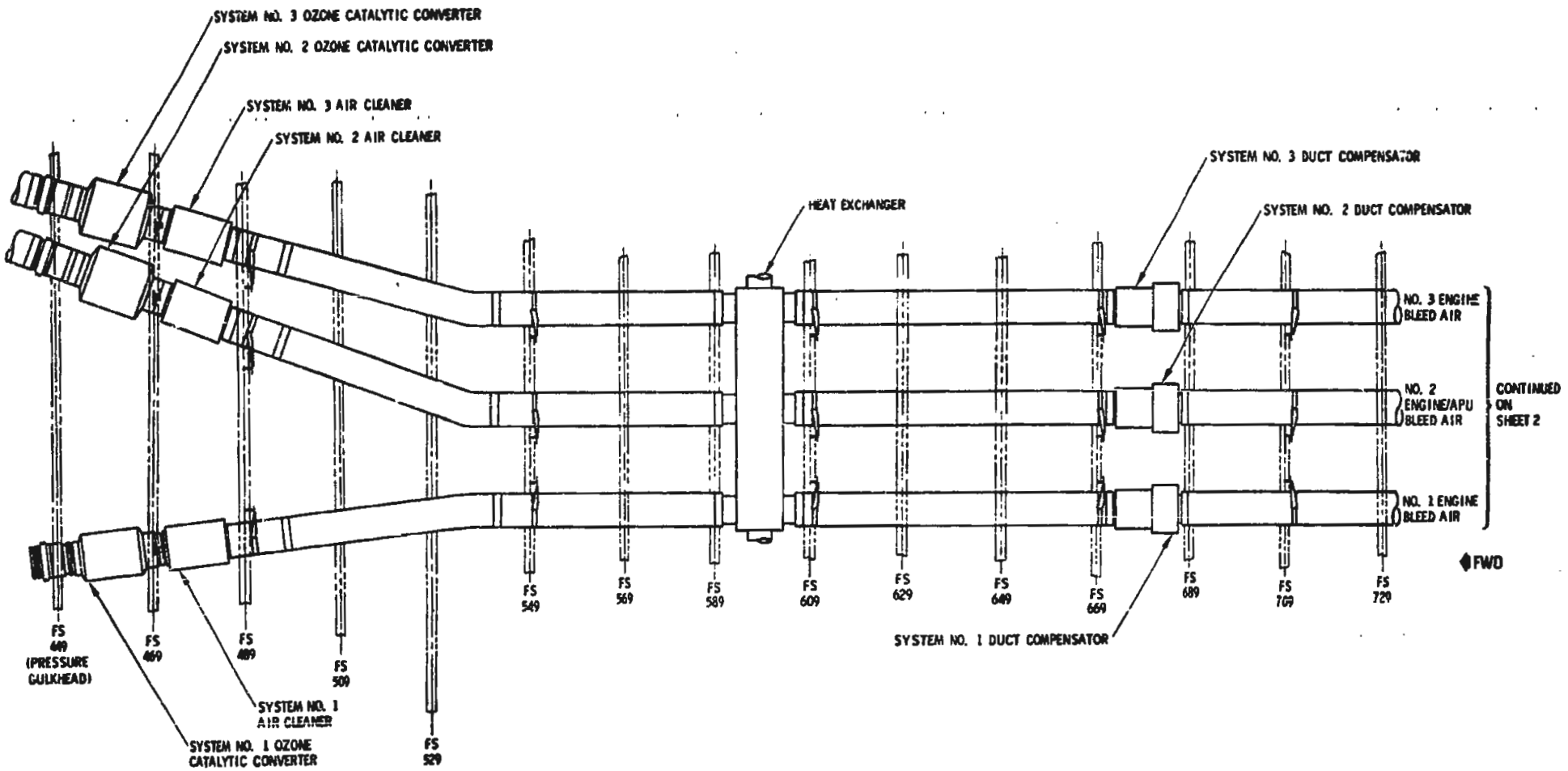
R WARNING: DO NOT ATTEMPT TO TIGHTEN A LEAKING DUCT OR OTHER
R COMPONENT CONNECTION WITH BLEED AIR APPLIED.

R (9) Check each connection in the repaired duct system for
R leaks. Turn off bleed air prior to tightening a
R connection, then recheck.

R (10) Turn off bleed air.

R (11) Install compartment floor panels. Refer to Para. 2 for
R required references.

R (12) Close and secure the Forward Hydraulic Service Center
R Access Panel 147AB.



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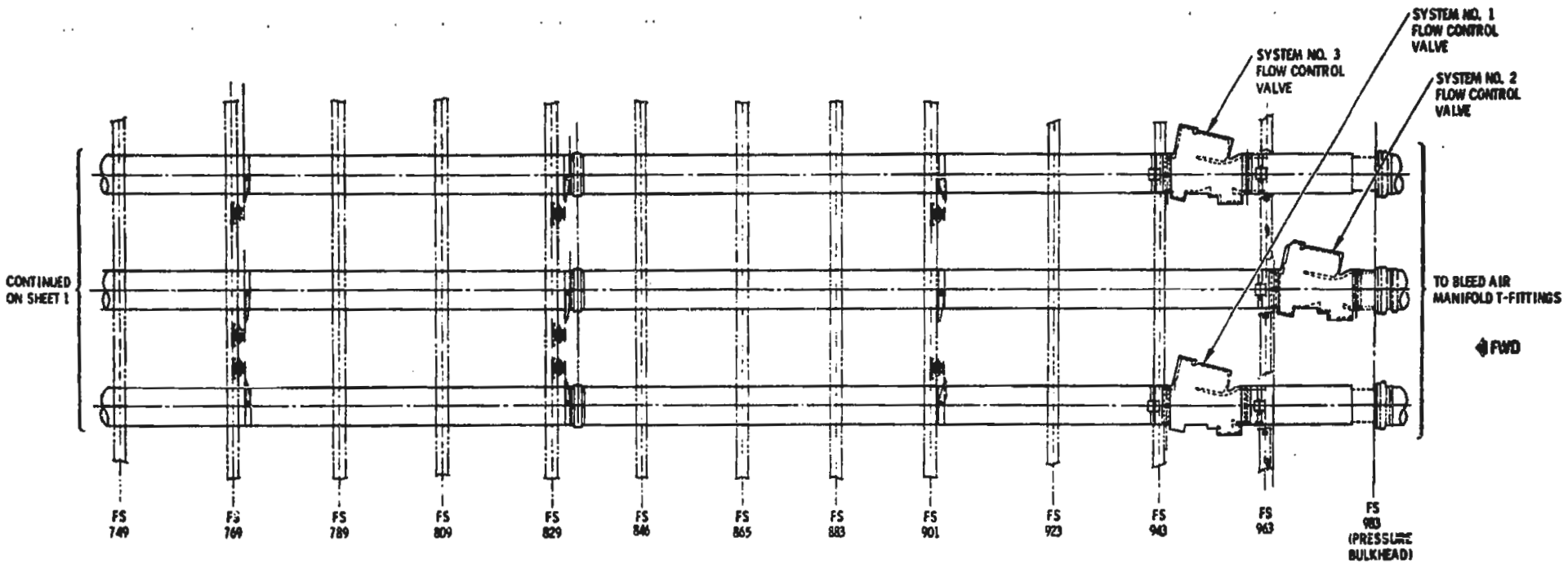
R R Bleed Air Duct FS449-FS983 Removal/Installation
Figure 401 (Sheet 1)

R R 001B EFFECTIVITY: ALL



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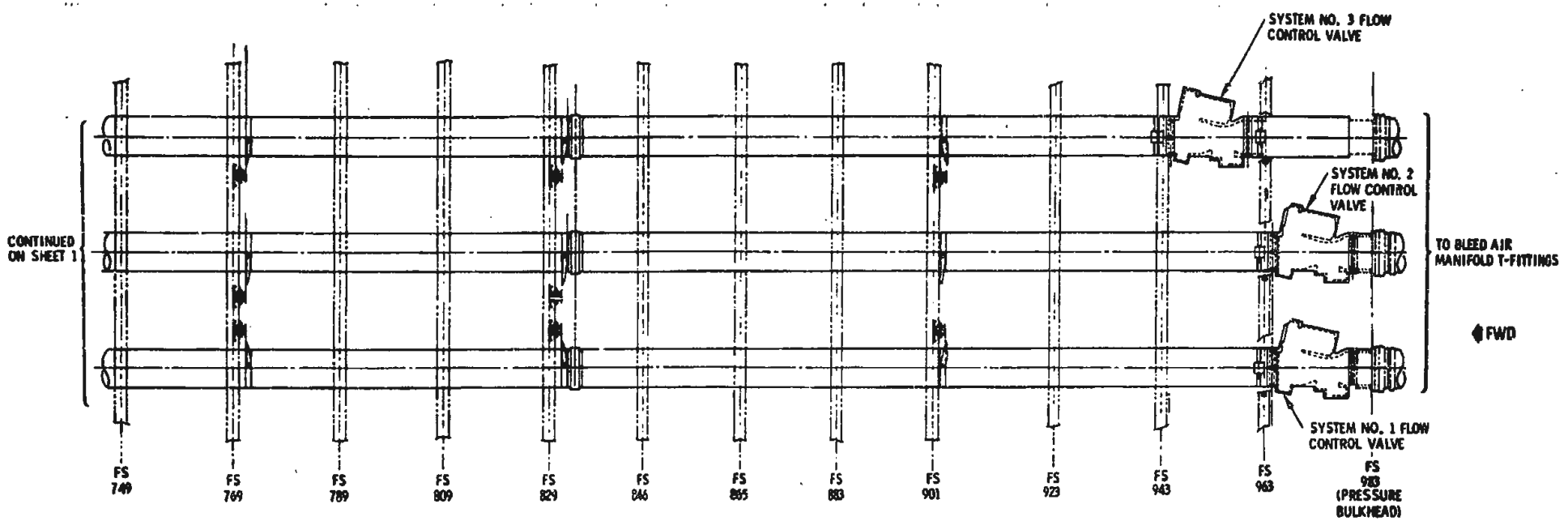
R Bleed Air Duct FS449-FS983 Removal/Installation
R Figure 401 (Sheet 2)

R EFFECTIVITY: FLOW CONTROL VALVE INSTL WITH
R DUAL BATTERIES OR PROVISIONS
001B FOR DUAL BATTERIES



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R Bleed Air Duct FS449-FS983 Removal/Installation
R Figure 401 (Sheet 2)

R EFFECTIVITY: FLOW CONTROL VALVE INSTL WITHOUT
R DUAL BATTERIES AND WITHOUT
001B PROVISIONS FOR DUAL BATTERIES

R FOUR-INCH DUCT PRESSURE SEAL REMOVAL AND INSTALLATION

1. General

The four-inch duct pressure seal is installed on the bleed air and hot manifold duct where it feeds through the fuselage station 378 bulkhead in the right environmental control system (ECS) compartment, zone 118.

2. Equipment and Material

Protective Caps

3. Referenced Procedures

6-40-00	Exterior Access Door and Panels, Zone 100
20-21-01	Flexible Swaged Coupling - Removal and Installation
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
21-51-01	Dual Heat Exchanger - Removal and Installation

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

R (2) On FE/SO aft circuit breaker panel, CB3, zone 215, open and tag circuit breakers:

BLEED - AIR - IND (R17)

ECS - AIR TEMP - IND. (V1)

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8).

R (3) Open ECS compartment door, 118 CR (Ref. 6-40-00).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN
R NECESSARY.

R (4) Remove heat exchanger compartment panels, 116 AR and
R 116 AR-1.

R (5) Remove pack number 2 dual heat exchanger (Ref.
R 21-51-01).

R (6) Remove T-bolt coupling from duct forward of 378
R bulkhead in heat exchanger compartment.

R (7) Remove screws holding duct on 378 bulkhead in heat
R exchanger compartment.

R (8) In the ECS compartment it may be necessary to remove some or all of the following ducts for access (Ref. Fig. 402):

(a) Remove 90° elbow on the upper right interconnecting duct by removing the T-bolt couplings at both ends.

(b) Remove duct section of the lower left interconnecting duct by removing the T-bolt couplings at both ends.

(c) Remove the upper left interconnecting duct where it feeds through 378 bulkhead.

(d) Remove flexible swaged coupling (Wig-O-Flex) forward of 378 bulkhead. (Ref. 20-21-01).

(e) Remove electrical connector from turbine inlet temperature sensor and install protective caps.

(f) Remove electrical connector from turbine bypass valve and install protective caps.

(g) Remove flexible swaged coupling (Wig-O-Flex) on one leg of "Y".

(h) Remove clamps that connect the turbine bypass valve to duct and pressure seal.

R (i) Remove pneumatic coupling flexible seal.

R R (j) Work Duct through 378 bulkhead into ECS compartment.

R (9) Remove electrical connector and pneumatic line from bleed air and hot manifold temperature sensor and install protective caps (Ref. Fig. 401).

R R (10) Remove clamp on the other leg of "Y" and connecting duct.

R R (11) Remove flexible swaged coupling (Wig-O-Flex) on the other leg of "Y".

R (12) Remove clamp on duct pressure seal.

R R (13) Work duct through the 378 bulkhead into ECS compartment.

R (14) Install protective caps on all open ducting.

R R (15) Remove mounting screws that hold duct pressure seal and retainer in place.

R (16) Remove duct pressure seal.

B. Installation

R R R (1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

R R (2) Verify circuit breakers opened in Step 4A(2) are open and tagged.

R R (3) Install duct pressure seal by mounting it inside the bulkhead structure.

R R (4) Line up mounting holes in retainer with bulkhead structure and drill hole pattern in duct pressure seal.

R (5) Install mounting screws with screwhead inside retainer.

R (6) Remove protective caps from ducting, wipe mating surfaces clean, and verify duct flanges are undamaged. Repair or replace as necessary.

R (7) Install pneumatic coupling flexible seal.

R R (8) Install flexible swaged coupling (Wig-O-Flex) on one leg of the "Y" (Ref. 20-21-01).

R (9) Install clamp and couplings.

R (10) Remove protective caps and install electrical connector
R and pneumatic line from bleed air and hot manifold
R temperature sensor.

R (11) Install ducts removed for access.

R (12) Install electrical connector.

R (13) Install screws holding duct on 378 bulkhead in heat
R exchanger compartment.

R (14) Install T-bolt coupling on duct forward of 378 bulkhead
R in heat exchanger compartment.

R (15) Install pack number 2 dual heat exchanger (Ref.
R 21-51-01).

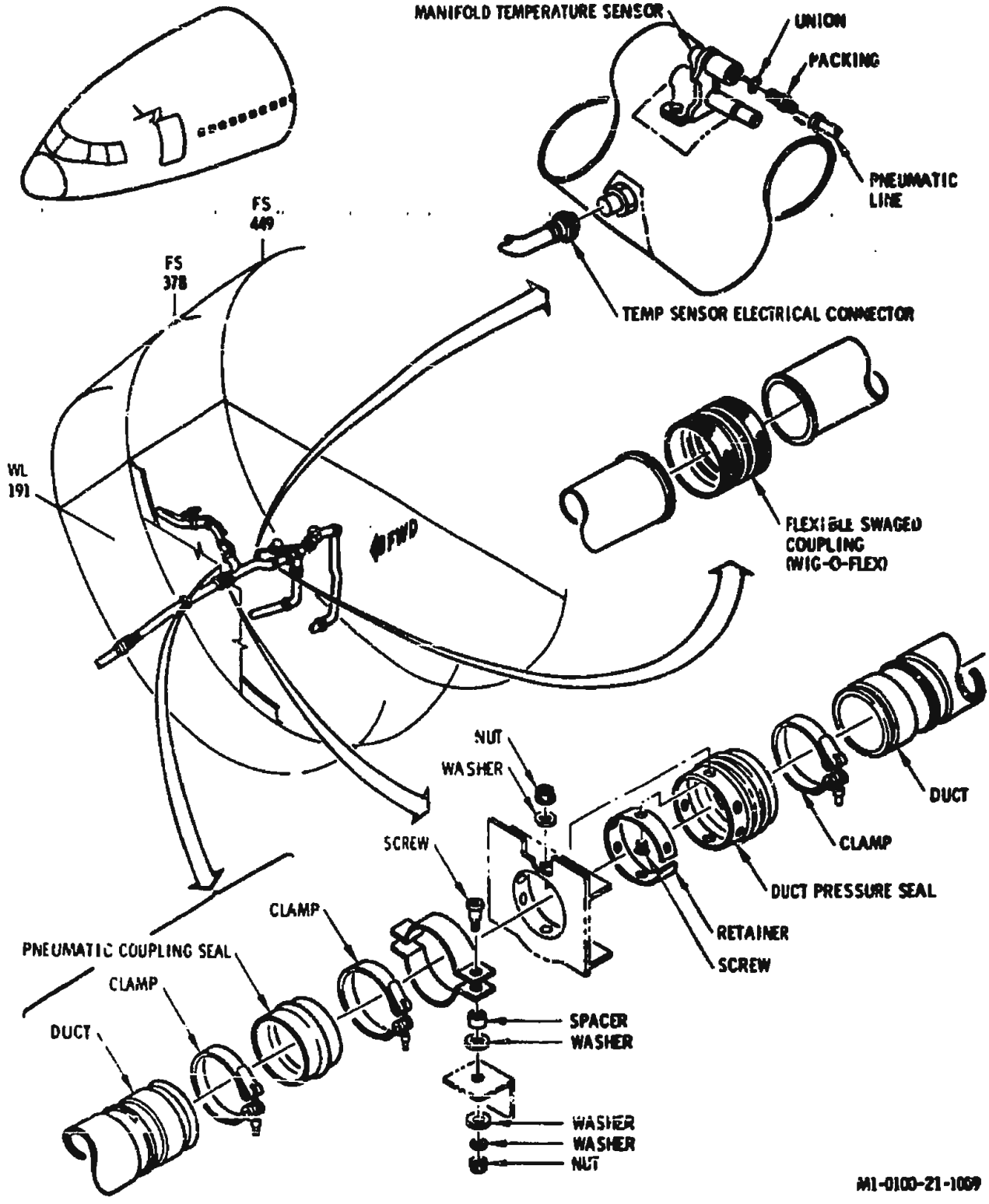
R (16) Remove tags and close circuit breakers previously
R opened in Step 4A(2).

R (17) Operate air cycle cooling system (Ref. 21-00-00) and
R check for leakage.

R (18) Install heat exchanger compartment panels.

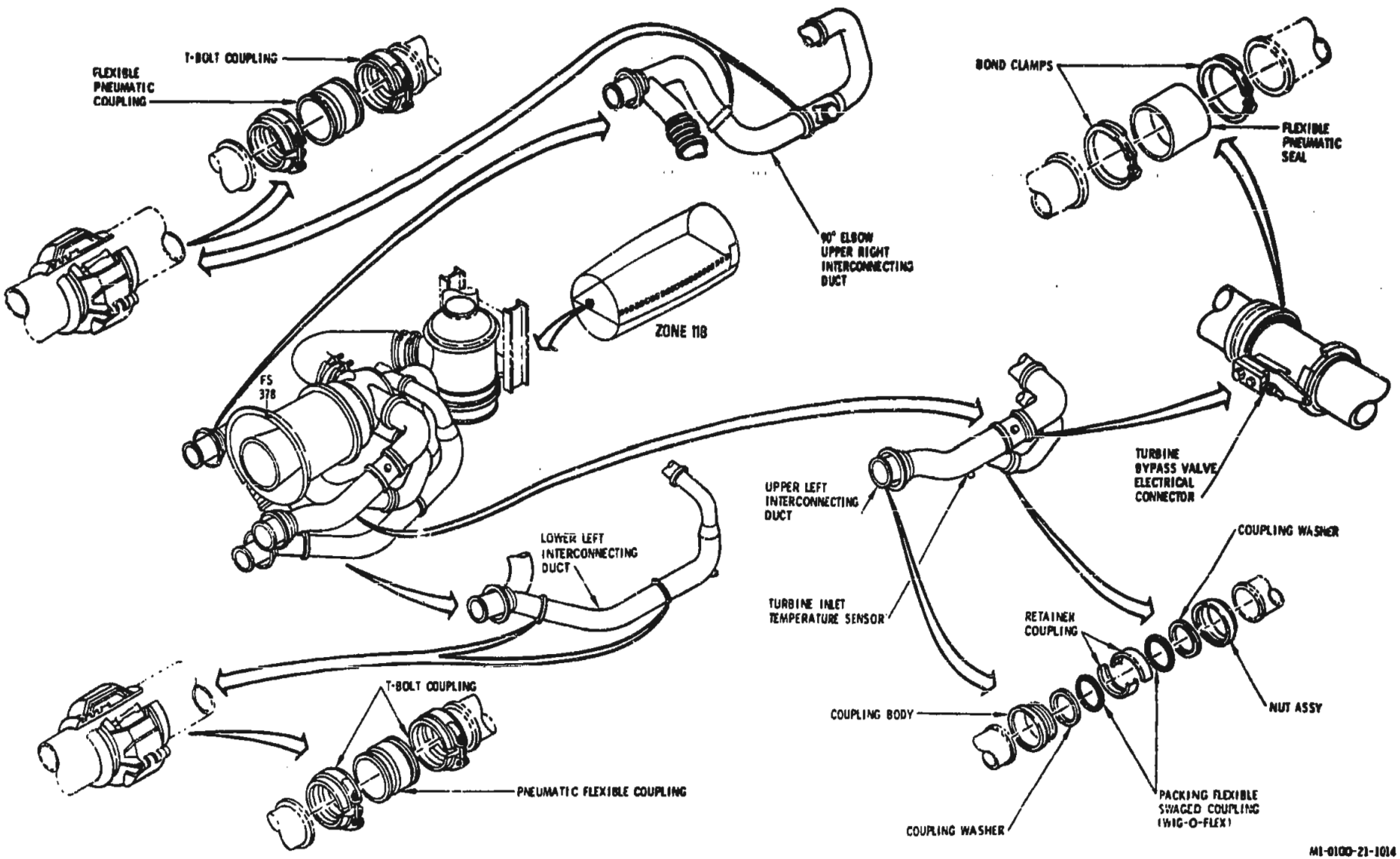
R (19) Close ECS compartment door.

R (20) Remove tags from FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections.



R 4-Inch Duct Pressure Seal - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
0018



R R Pack No. 2 Interconnecting Ducts - Removal and Installation
Figure 402

R R 0018 EFFECTIVITY: ALL

SEVEN-INCH DUCT PRESSURE SEAL - REMOVAL AND INSTALLATION

1. General

The nine 7-inch duct pressure seals are installed on the ducts connecting the heat exchanger to the pack air cycle machine.
R The duct pressure seals are located on fuselage station 378
R bulkhead in the left and right environmental control system
R (ECS) compartments, zones 117 and 118 (Ref. Fig. 401).

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

	6-40-00	Exterior Access Doors and Panels, Zone 100
	20-21-01	Flexible Swaged Coupling - Removal and Installation
R	20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices
	21-51-01	Dual Heat Exchanger - Removal and Installation

4. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS ENGINE BLEED CONTROL AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

A. Pack number 1 (Ref. Fig. 402)

(1) Open ECS compartment door, 117AL (Ref. 6-40-00).

(2) Remove heat exchanger compartment panels, 115AL and 115AL-1.

(3) Remove clamp from duct pressure seal (Ref. Fig. 401).

R (4) Remove upper right interconnecting duct:

(a) Remove T-bolt coupling connecting duct to heat exchanger (Ref. 20-36-01).

(b) Remove T-bolt coupling on both legs of "Y".

R (5) Remove lower left interconnecting duct:

(a) Remove T-bolt coupling connecting duct to heat exchanger (Ref. 20-36-01).

(b) On one leg of the "Y" remove T-bolt coupling connecting compressor bypass check valve from duct leaving check valve on the duct to be removed.

(c) On the other leg of the "Y" remove T-bolt coupling.

R (6) Remove upper left interconnecting duct:

(a) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, Zone 215, open and tag circuit breakers:

R BLEED - AIR - IND (R17)

PACK 1 - AUTO/MAN DC (V5)

PACK 1 - AUTO/MAN AC (V6).

(b) Remove flexible swaged coupling (Wig-O-Flex) connecting duct to heat exchanger (Ref. 20-21-01).

(c) Remove electrical plug from Turbine Inlet Temperature Sensor and install protective caps.

(d) Remove electrical plug from Turbine Bypass Valve and install protective caps.

(e) Remove flexible swaged coupling (Wig-O-Flex) on one leg of the "Y".

R R (f) Remove 2 flat band T-bolt clamps from pressure seal coupling upstream of Turbine Bypass Valve leaving valve on duct to be removed.

R (g) Remove pressure seal from valve.

(7) Work duct through duct pressure seal into ECS compartment and install protective caps.

(8) Remove mounting screws that hold duct pressure seal and retainer in place.

(9) Remove duct pressure seal.

B. Pack number 2 (Ref. Fig. 403)

(1) Open ECS compartment door 118CR (Ref. 6-40-00).

(2) Remove heat exchanger compartment panels 116AR and 116AR-1.

(3) Remove clamp from duct pressure seal (Ref. Fig. 401).

R (4) Remove upper right interconnecting duct:

(a) Remove T-bolt coupling connecting duct to heat exchanger (Ref. 20-36-01).

(b) Remove T-bolt coupling on both legs of "Y".

R (5) Remove lower left interconnecting duct:

(a) Remove T-bolt coupling connecting duct to heat exchanger.

(b) Remove the 90° elbow on the lower right interconnecting duct by removing T-bolt couplings on both ends of duct (Ref. Fig. 401).

(c) On one leg of the "Y" remove T-bolt coupling connecting compressor bypass check valve from duct leaving check valve on the duct to be removed.

(d) On the other leg of the "Y" remove T-bolt coupling.

R (6) Remove upper left interconnecting duct:

(a) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, Zone 215, open and tag circuit breakers:

R BLEED - AIR - IND (R17)

PACK 2 - AUTO/MAN - AC (V8)

PACK 2 - AUTO/MAN - DC (V7)

(b) Remove flexible swaged coupling (Wig-O-Flex) connecting duct to heat exchanger (Ref. 20-21-01).

(c) Remove electrical plug from turbine inlet temperature sensor and install protective caps.

(d) Remove electrical plug from turbine bypass valve and install protective caps.

(e) Remove flexible swaged coupling (Wig-O-Flex) on one leg of the "Y".

R R R (f) Remove 2 flat band T-bolt clamps from pressure seal coupling upstream of turbine bypass valve leaving valve on duct to be removed.

R (g) Remove pressure seal from valve.

R (7) Work duct through duct pressure seal into ECS compartment and install protective caps.

(8) Remove mounting screws that hold duct pressure seal and retainer in place.

(9) Remove duct pressure seal.

C. Pack number 3 (Ref. Fig. 404)

(1) Open ECS compartment door 118CR (Ref. 6-40-00).

(2) Remove heat exchanger compartment access panels, 116BR and 116BR-1.

(3) Remove clamp from duct pressure seal (Ref. Fig. 401).

R (4) Remove upper right interconnecting duct:

(a) Remove T-bolt coupling connecting duct to heat exchanger (Ref. 20-36-01).

(b) Remove T-bolt coupling on both legs of "Y".

(c) Remove duct support.

R (5) Remove lower left interconnecting duct:

(a) On Flight Engineer/Second Officer aft circuit breaker panel, CB3, zone 215, open and tag circuit breaker BLEED - AIR - IND (R17).

(b) Remove electrical plug from compressor discharge sensor and install protective caps.

(c) Remove T-bolt coupling connecting duct to the heat exchanger.

(d) On one leg of the "Y" remove T-bolt coupling connecting compressor bypass check valve from duct leaving check valve on the duct to be removed.

(e) On the other leg of the "Y" remove T-bolt coupling.

R (6) Remove upper left interconnecting duct:

(a) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, zone 215, open and tag circuit breakers:

R BLEED AIR IND (R17)

PACK 3 - AUTO/MAN - DC (V17)

PACK 3 - AUTO/MAN - AC (V18)

(b) Remove flexible swaged coupling (Wig-O-Flex) connecting duct to heat exchanger (Ref. 20-21-01).

(c) Remove electrical plug from turbine inlet temperature sensor and install protective caps.

(d) Remove electrical plug from turbine bypass valve and install protective caps.

(e) Remove flexible swaged coupling (Wig-O-Flex) on one leg of the "Y".

R R R (f) Remove 2 flat band T-bolt clamps from pressure seal coupling upstream of turbine bypass valve leaving valve or duct to be removed.

R (g) Remove pressure seals from valve.

(h) To remove duct it may be necessary to remove duct as outlined in Step 4C(5) and the next section of that duct by removing the T-bolt coupling at the other end.

R (7) Work duct through duct pressure seal into ECS compartment and install protective caps.

(8) Remove mounting screws that hold duct pressure seal and retainer in place.

(9) Remove duct pressure seal.

D. Installation

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO ENGINE BLEED CONTROL AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Install duct pressure seal inside bulkhead structure and retainer inside pressure seal.

(2) Line up mounting holes in retainer and bulkhead structure.

(3) Drill screw hole pattern in duct pressure seal from bulkhead structure.

(4) Install mounting screws with screw heads inside retainer.

(5) Remove protective caps from ducting, wipe mating surfaces clean and verify duct flanges are undamaged. Repair or replace as necessary.

(6) Install duct that runs through the duct pressure seal.

(7) Install clamp on duct pressure seal.

(8) Reconnect ducts as necessary.

(9) Install and connect ducts removed for access.

(10) Install electrical plugs as necessary.

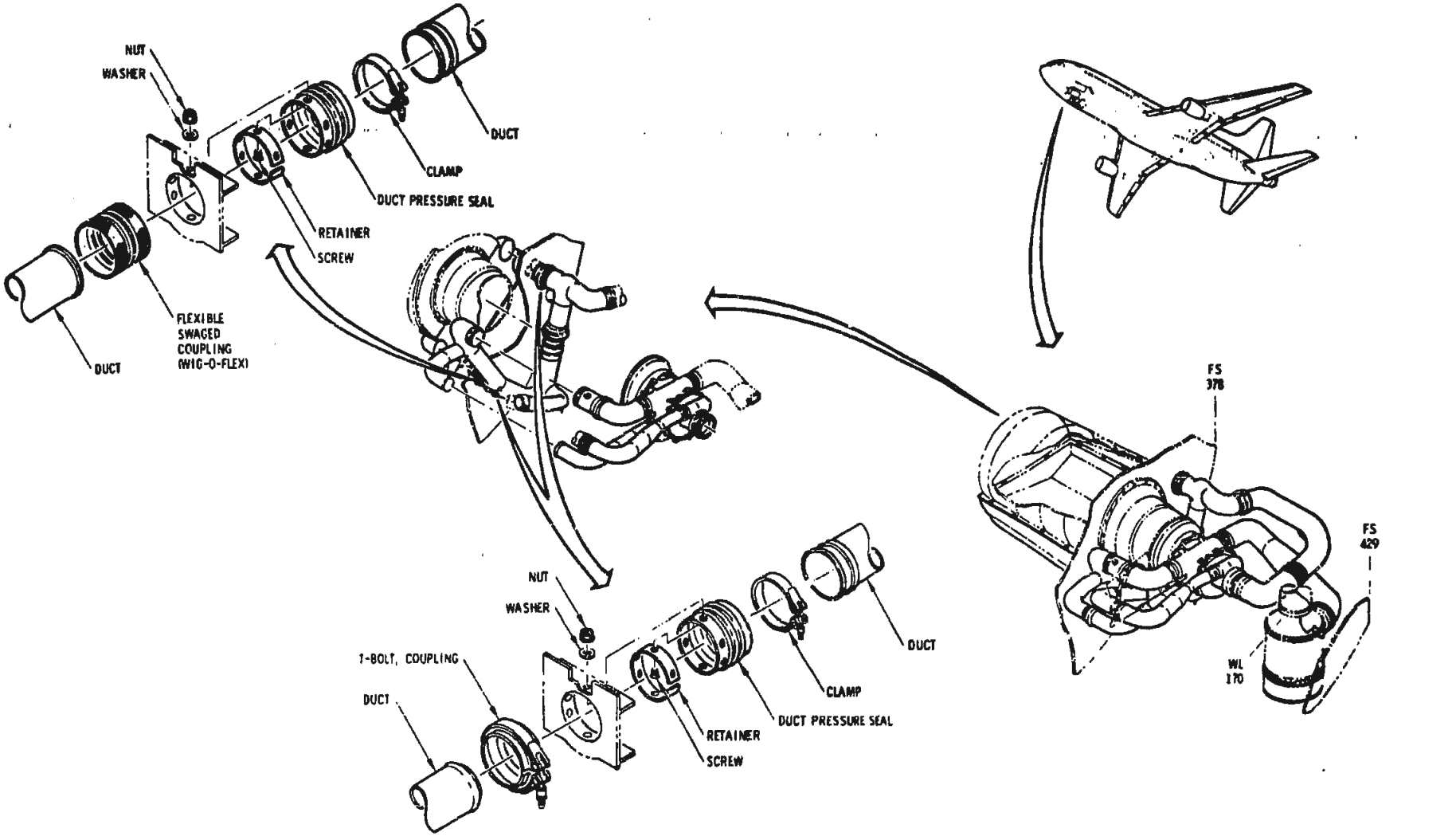
(11) Remove tags and close applicable circuit breakers.

(12) Operate air cycle cooling system (Ref. 21-00-00) and check for leaks.

(13) Close ECS compartment door.

(14) Install heat exchanger access panels.

(15) Remove WARNING tags from FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections.



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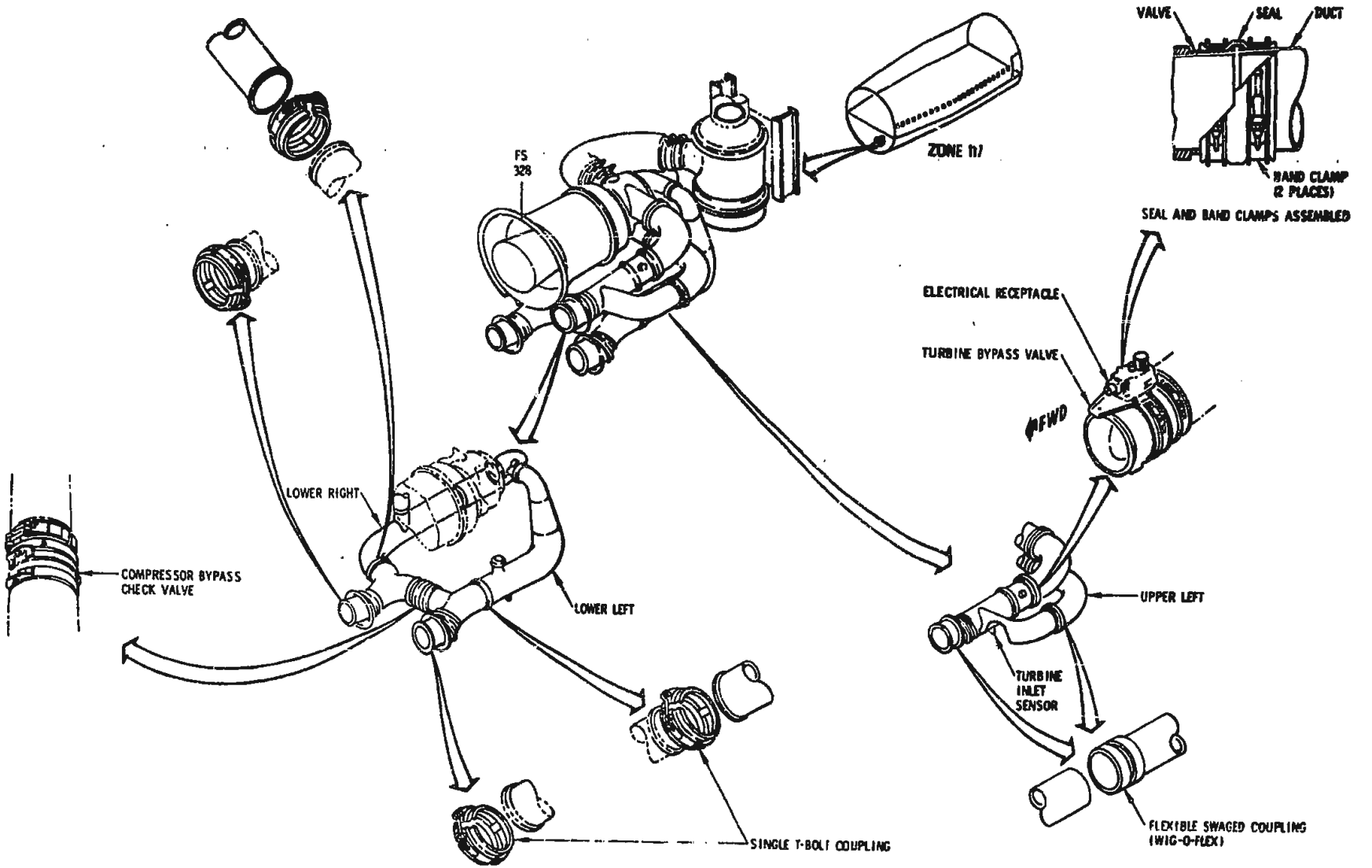
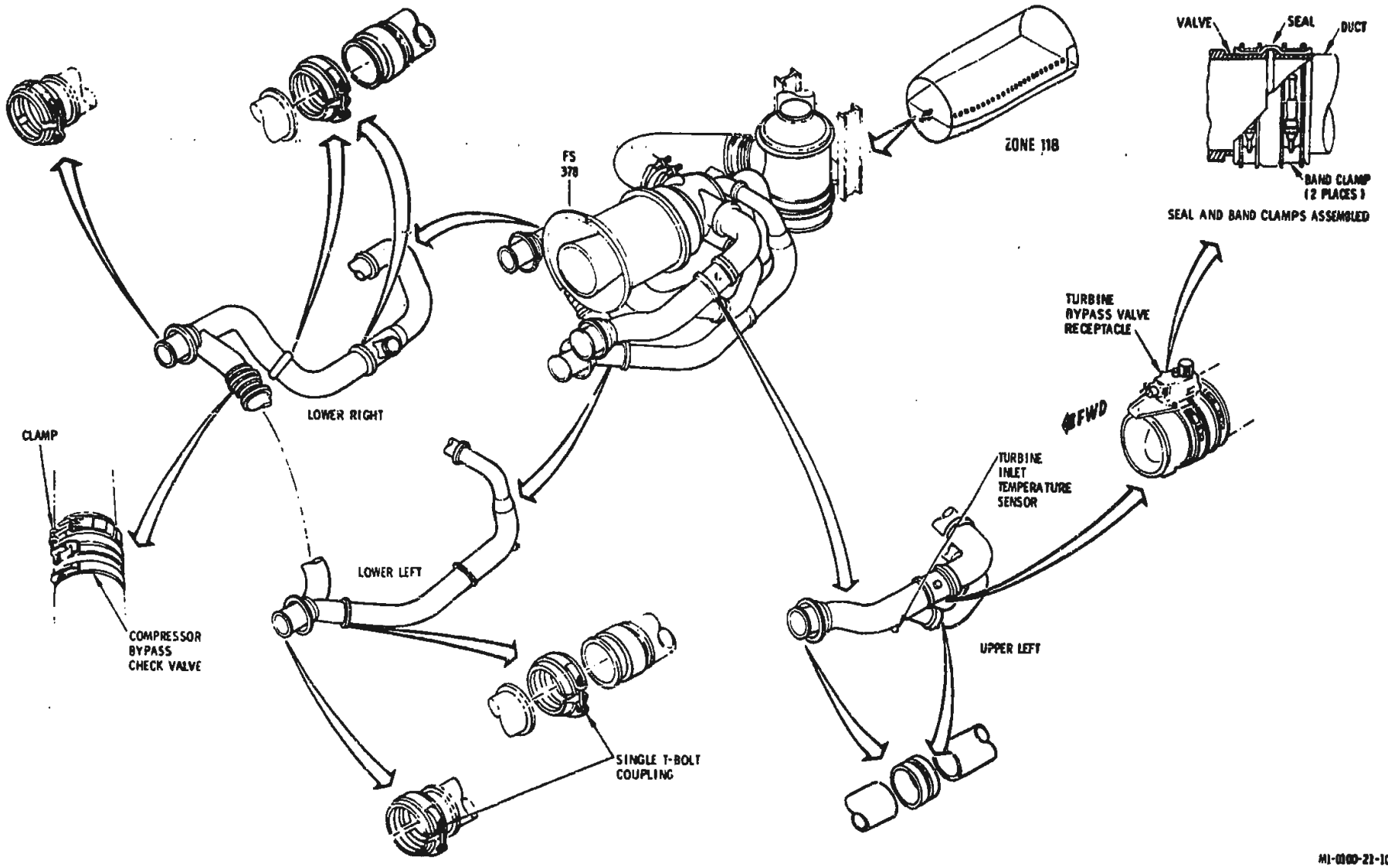
R 7-Inch Duct Pressure Seal - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
R
001B



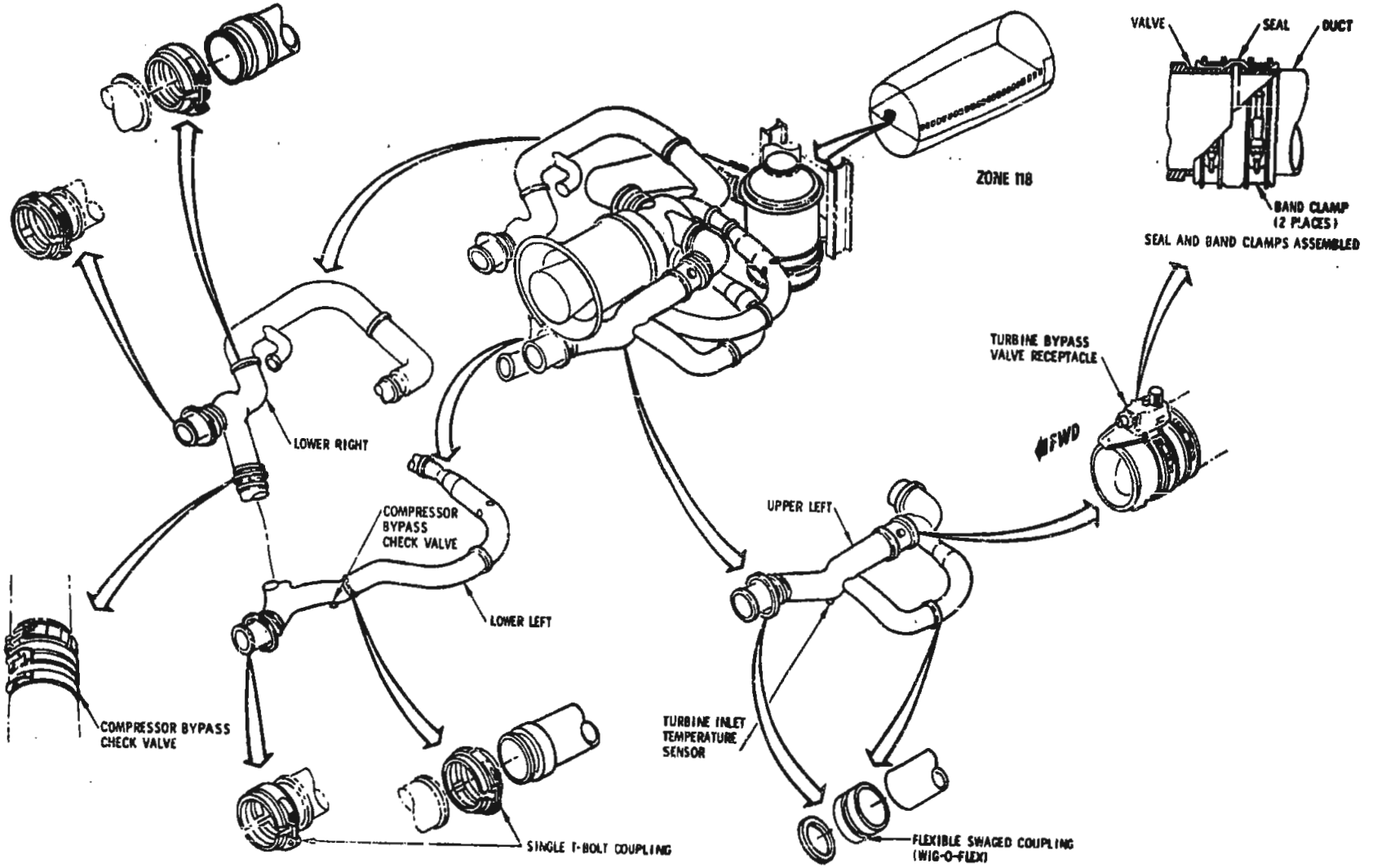
R Pack Number 1 Interconnecting Ducts
R Figure 402

R EFFECTIVITY: ALL
R
R
0018



Pack Number 2 Interconnecting Ducts
Figure 403

EFFECTIVITY: ALL



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R R Pack Number 3 Interconnecting Ducts
Figure 404

R R EFFECTIVITY: ALL

EIGHT-INCH STANDARD DUCT PRESSURE SEAL REMOVAL AND INSTALLATION

1. General

The 8-inch standard duct pressure seals are installed on the
R bleed air supply ducts feedthrough at fuselage station 378
R bulkhead in the right environment control system (ECS) compartment, zone 118.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels, Zone 100
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System

4. Removal/Installation

A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUSTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Open ECS compartment door 118CR (Ref. 6-40-00).

(2) Remove heat exchanger compartment panels 116AR and 116AR-1 (No. 2) or 116BR and 116BR-1 (No. 3). (Ref. Fig. 401).

R CAUTION: CARE SHOULD BE TAKEN TO PREVENT DAMAGE TO THE LOOP SENSOR (Ref. 36-22-00).

R (3) Remove clamp from duct pressure seal.

R (4) Remove covers over the single T-bolt couplings at both
R ends of the duct that goes through the duct pressure
R seal.

R (5) Remove the single T-bolt couplings on both ends of duct
R (Ref. 20-36-01).

R (6) Remove bolt from duct support.

R (7) Work the duct through the duct pressure seal into the
R ECS compartment and install protective caps.

R (8) Remove mounting screws that holds duct pressure seal
R and retainer in place.

R (9) Remove duct pressure seal.

R B. Installation

R WARNING: VERIFY THAT WARNING TAGS PREVIOUSLY INSTALLED ON
R FE/SO ENGINE BLEED CONTROL AND APU CONTROL PANELS
R AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS
R ARE IN PLACE.

R (1) Install duct pressure seal inside bulkhead structure
R and retainer inside pressure seal.

R (2) Line up mounting holes in retainer and bulkhead
R structure.

R (3) Drill screw hole pattern in duct pressure seal from
R bulkhead structure.

R (4) Install mounting screws with screw heads inside
R retainer.

R (5) Remove protective caps from ducting, wipe mating
R surfaces clean and verify duct flanges are undamaged.
R Repair or replace as necessary.

R (6) Install the duct that runs through the duct pressure
R seal.

R (7) Install bolt in duct support.

R (8) Install single T-bolt couplings on both end of duct
R (Ref. 20-36-01).

R (9) Install clamp on duct pressure seal.

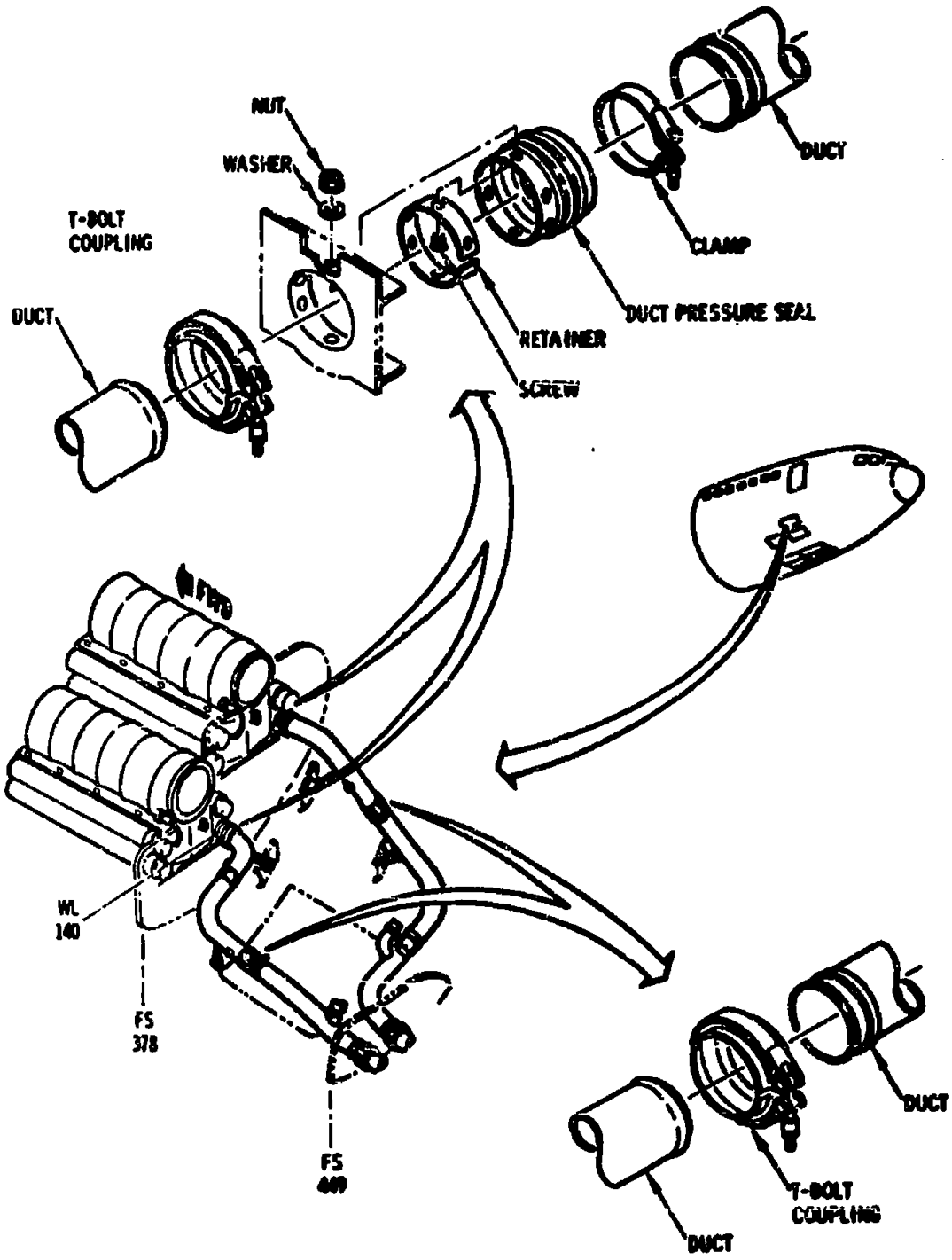
R (10) Operate air cycle cooling system and check for leakage
R (Ref. 21-00-00).

R (11) Install cover over single T-bolt couplings.

R (12) Install heat exchanges compartment panels.

R (13) Close ECS compartment door.

R (14) Remove WARNING tags from FE/SO ENGINE BLEED CONTROL and
R APU CONTROL panels and the three high-pressure ground
R air connections.



R Eight-Inch Standard Duct Pressure Seal - Removal and Installation
R Figure 401

EIGHT-INCH SPECIAL DUCT PRESSURE SEAL REMOVAL AND INSTALLATION

1. General

The 8-inch special duct pressure seal is installed on the bleed
R air supply duct feedthrough at fuselage station 378 bulkhead in the left environmental control system (ECS) compartment, zone 117.

2. Equipment and Material

Protective Caps

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels, Zone 100
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System

4. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS ENGINE BLEED CONTROL AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONSS TO PREVENT OPERATION UNTIL COMPLETION.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

A. Removal

(1) Open ECS compartment door 117AL (Ref. 6-40-00).

(2) Remove heat exchanger compartment panels 115AL and 115AL-1.

R CAUTION: CARE SHOULD BE TAKEN TO PREVENT DAMAGE TO LOOP SENSOR (REF. 36-22-00).

(3) Remove clamp from duct pressure seal (Ref. Fig. 401).

(4) Remove cover over single T-bolt coupling on both ends of duct going through duct pressure seal.

(5) Remove single T-bolt coupling on both ends of duct (20-36-01).

(6) Remove bolt from duct support.

(7) Work duct out of duct pressure seal and into ECS compartment. Install protective caps.

(8) Remove the mounting screws that hold the duct pressure seal and retainer in place.

(9) Remove the duct pressure seal.

B. Installation

R WARNING: VEIRFY THAT WARNING TAGS PREVIOUSLY INSTALLED ON THE FE/SO ENGINE BLEED CONTROL AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Install duct pressure seal inside bulkhead structure and retainer inside pressure seal.

(2) Line up mounting holes in retainer and bulkhead structure.

(3) Drill screw hole pattern in duct pressure seal from bulkhead structure.

(4) Install mounting screws with screw heads inside retainer.

(5) Remove protective caps from ducting, wipe mating surfaces clean and verify ducts flanges are undamaged. Repair or replace as necessary.

(6) Install the duct that runs through the duct pressure seal.

(7) Install bolt in duct support.

(8) Install single T-bolt couplings on both end of duct (Ref. 20-36-01).

(9) Install clamp on duct pressure seal.

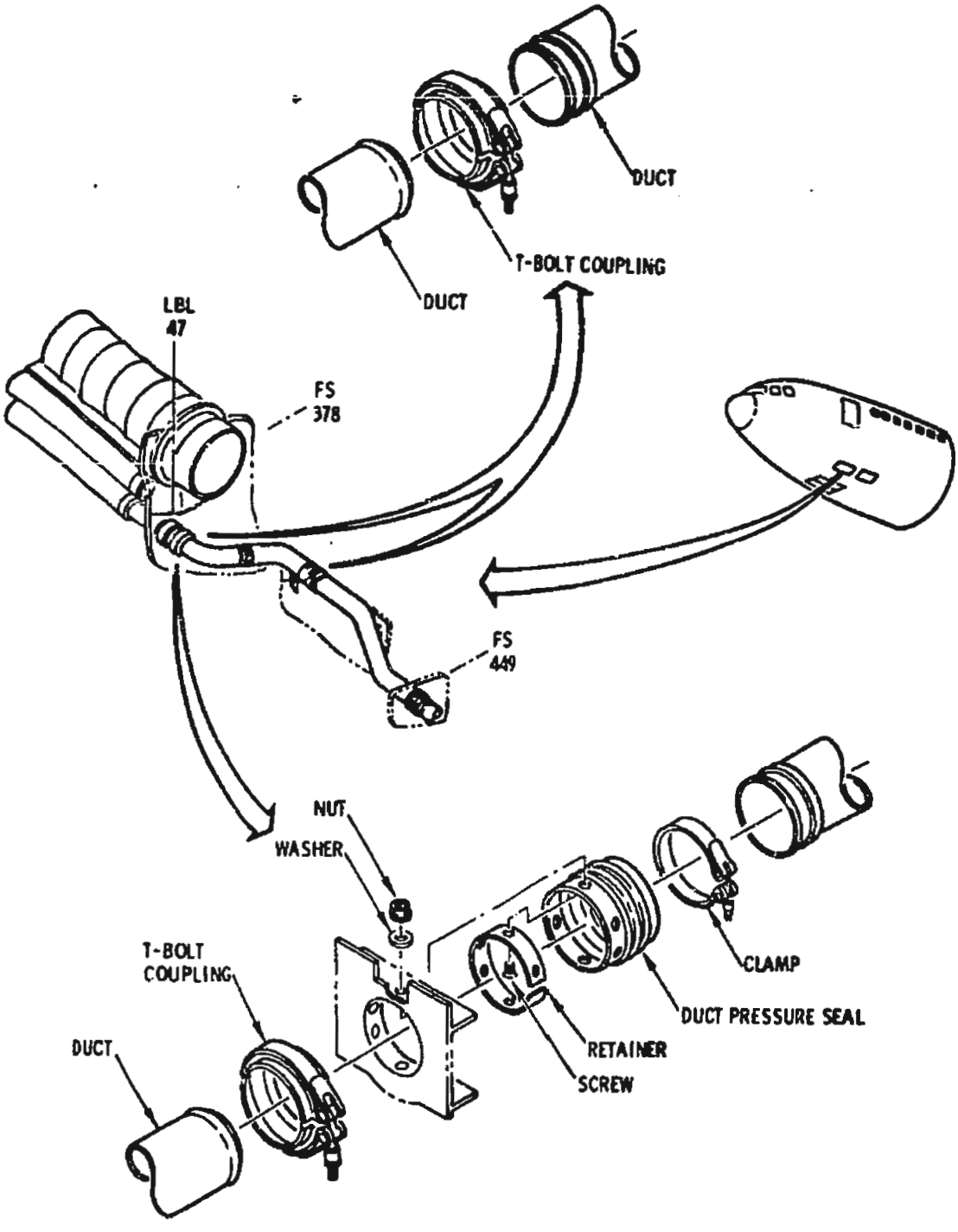
(10) Operate air cycle cooling system and check for leakage (Ref. 21-00-00).

(11) Install cover over single T-bolt couplings.

(12) Install heat exchanger compartment panels.

(13) Close ECS compartment door.

(14) Remove WARNING tags from FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections.



M1-0101-21-1001

R R 8-Inch Special Duct Pressure Seal - Removal and Installation
Figure 401

R COMPRESSOR DISCHARGE OVERTEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. General

R The compressor discharge overtemperature switch is mounted on the discharge housing of each air cycle machine (ACM). Pack No. 1 ACM is located in the left environmental control system (ECS) compartment, zone 117, and pack No. 2 and No. 3 ACM are located in the right ECS compartment, zone 118. Access is through compartment door 117AL for the left compartment and 118CR for the right compartment.

2. Equipment and Materials

Protective caps and plugs

O-ring, MS9068-018, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.020-inch diameter, or equivalent

3. Referenced Procedure

6-40-00 Exterior Access Doors and Panels, Zone 100

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three-high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

R (2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag the following circuit breakers:

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5).

R (3) Open ECS compartment door 117 or 118, (Ref. 6-40-00).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROULSY HIGH
R SYSTEM TEMPERATURES. USE PROTECTIVE GLOVES WHEN
R NECESSARY.

R (4) Disconnect electrical cable from overtemperature switch
R on applicable ACM (Ref. Fig. 401).

R (5) Install protective caps on connector and switch
R receptacle.

R (6) Remove switch from compressor discharge housing and
R discard O-ring.

R (7) Install protective plug in housing opening.

B. Installation

R (1) Verify tags previously installed on FE/SO ENGINE BLEED
R CONTROL and APU CONTROL panels and the three
R high-pressure ground air connections are in place.

R (2) Verify that circuit breaker opened in Step 4A(1) is
R open and tagged.

R (3) Install new O-ring on overtemperature switch.

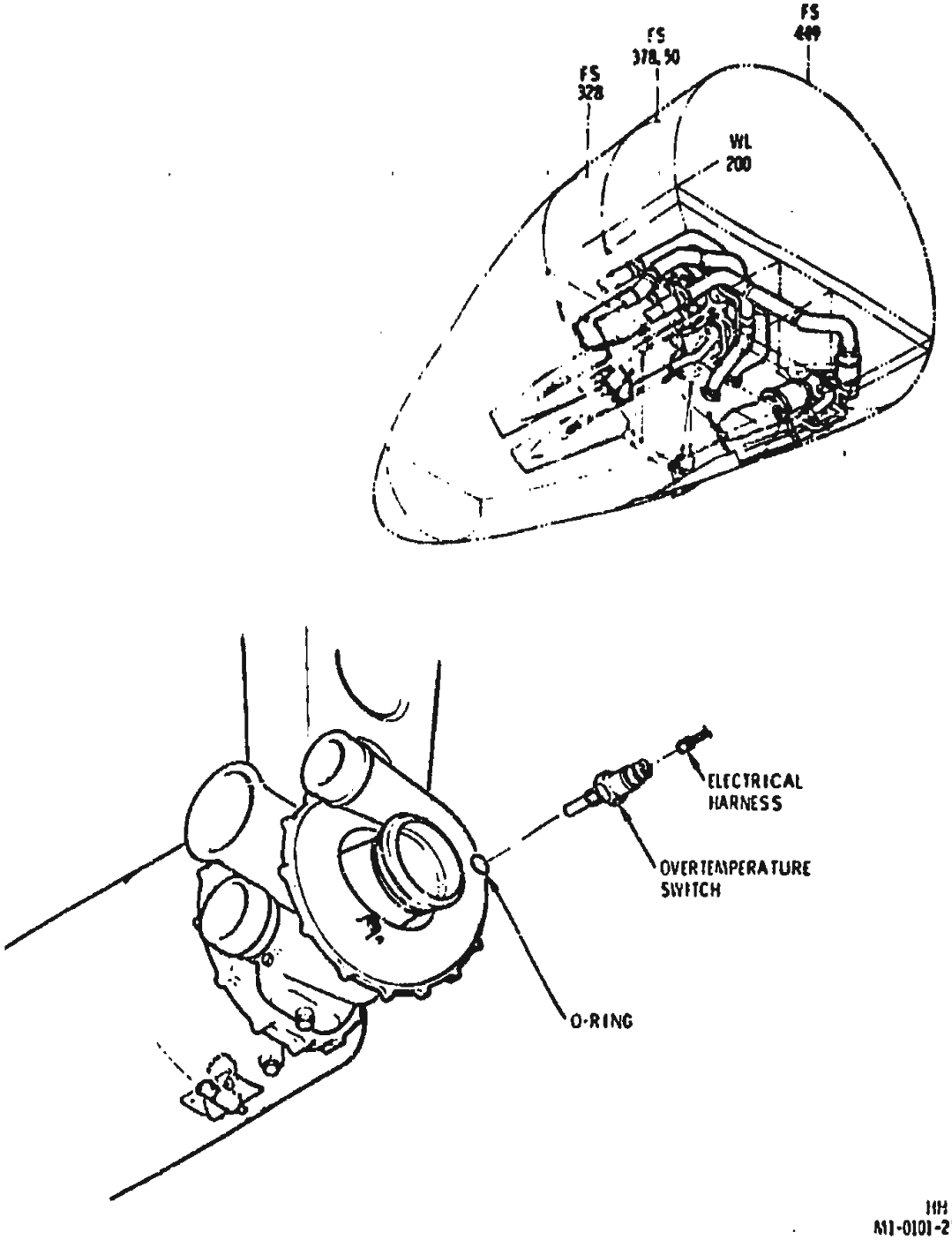
R (4) Remove protective plug from ACM compressor housing,
R install switch, and lock-wire.

R (5) Remove protective caps and connect electrical connector
R to switch.

R (6) Close ECS compartment door.

R (7) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (8) Remove Warning tags installed in Paragraph 4A.



HH 8758
M1-0101-21-211

R Compressor Discharge Overtemperature Switch - Removal and
R Installation
R Figure 401

EFFECTIVITY: ALL

0016

PACK DISCHARGE OVERTEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. General

R R R The discharge overtemperature switches for packs No. 2 and 3 are located in right hand side environmental control system (ECS) compartment on ducts leading from the water separators to the cold air plenum (zone 118). Pack No. 1 discharge overtemperature switch is in left hand side ECS compartment on the duct leading from the water separator to the cold air plenum (zone 117). Pack No. 2 and 3 switches are accessible through the ECS door 118 CR, and Pack No. 1 switch is accessible through ECS door 117AL (Ref. Fig. 401).

NOTE: The discharge overtemperature switches are located near other sensors which can be confused with one another. These other sensors are: the discharge temperature sensors (Ref. 21-62-22) near the pack No. 1, No. 2 and No. 3 discharge overtemperature switches; and the pack flow rate transducers (Ref. 21-63-05) near the pack No. 2 and No. 3 discharge overtemperature switches. The discharge overtemperature switch is most easily distinguished from the other sensors by the mounting flange which is smaller than the others (Ref. Fig. 401).

2. Equipment and Materials

Lock-wire, 0.032-inch diameter, Fed Spec QQ-W-390, Cond A, or equivalent

O-ring, Parker P/N 3-08S604-7, or equivalent

R Protective Caps

R 3. Referenced Procedures

R 6-40-00 Exterior Access Doors and Panels, Zone 100

R 4. Removal/Installation

A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) R On pilots overhead circuit breaker panel CB1, zone 210, open and tag the following circuit breakers:

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1
R (H3),

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2
R (H4),

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3
R (H5).

(2) Open ECS compartment door 118CR for access to pack No. 2 and pack No. 3 discharge overtemperature switches or
R compartment door 117AL for access to pack No. 1 switch
R (Ref. 6-40-00).

R (3) Disconnect electrical connector from overtemperature
R switch.

R (4) Install protective caps on connector and switch
R receptacle.

R (5) Loosen switch mounting nut.

R (6) Remove switch from duct boss and discard o-ring.

R (7) Install protective plug in duct boss opening.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANEL AND THE THREE HIGH PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

R (1) Verify that circuit breaker opened in Step 4A (1) is open and tagged.

(2) Install a new O-ring under switch mounting surface.

(3) Install switch into the duct.

(4) Tighten switch mounting nut.

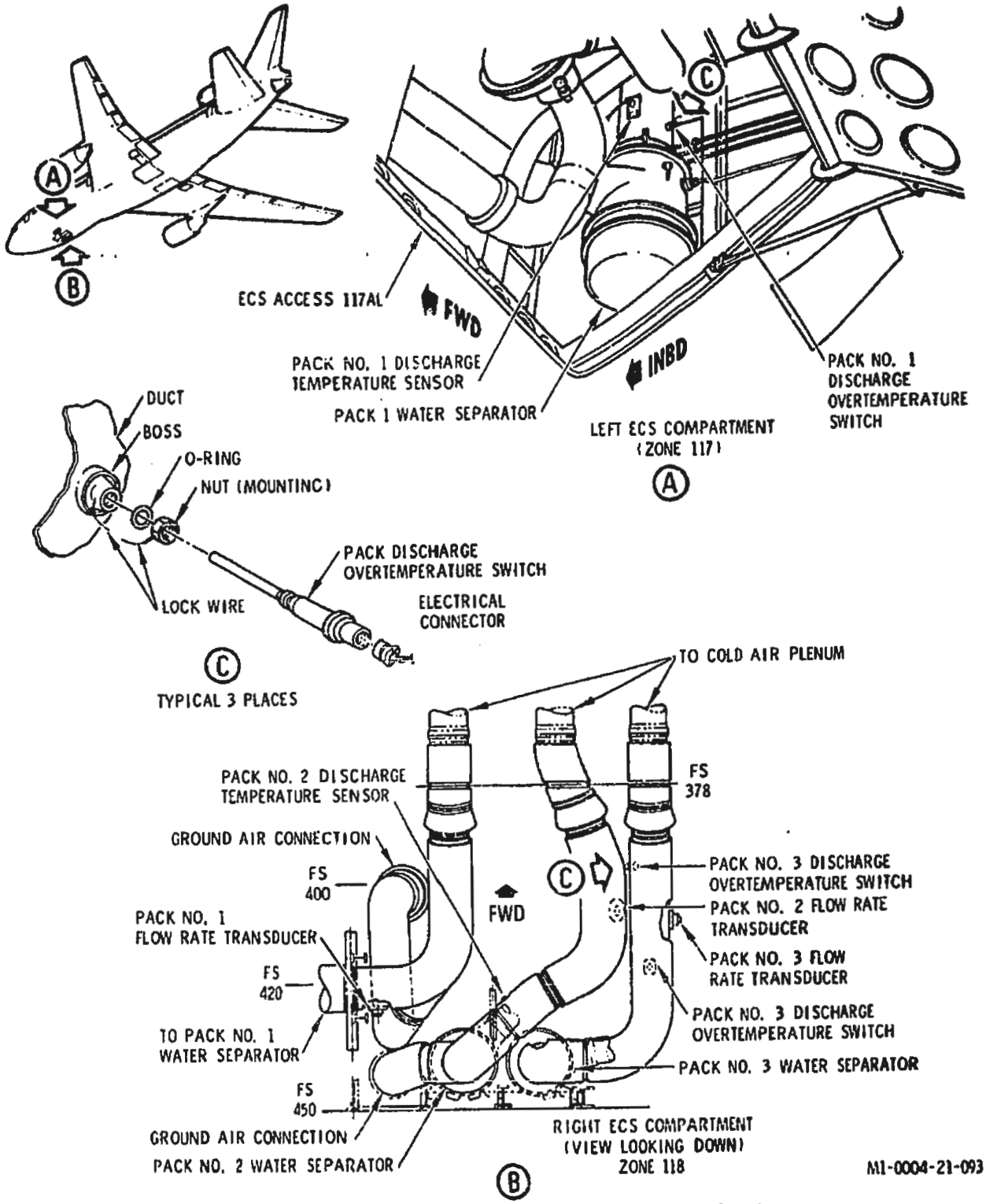
(5) Install lock-wire between nut and duct boss.

(6) Connect electrical connector on switch.

R (7) Close ECS compartment door opened in Step 4A(2).

R (8) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (9) Remove warning tags installed in Paragraph 4A.



R Pack Discharge Overtemperature Switch
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

PRECONDITIONED GROUND AIR CHECK VALVES - REMOVAL AND INSTALLATION

1. General

The preconditioned ground air check valves for packs No. 1 and 2 are in the right environmental control system (ECS) compartment, zone 118, immediately forward of the FS 449 bulkhead. Access is through ECS compartment access door 118CR.

Pack No. 1 valve is mounted forward of No. 2. Removal and installation procedures are the same for both valves.

2. Equipment and Materials

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Protective Caps

Thread, Fed. Spec. V-T-285, Type E, Class I, or equivalent

3. Referenced Procedures

R	6-40-00	Exterior Access Doors and Panels, Zone 100
	20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: PLACARD FLIGHT ENGINEER/SECOND (FE/SO) OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

R (1) Open ECS compartment access door 118CR (Ref. 6-40-00).

(2) Remove cover from valve (Ref. Fig. 401).

R (3) Remove band clamp securing seal at lower end of valve
R to valve inlet duct (Ref. Fig. 401). Slide band clamp
R down onto duct.

R (4) Remove single T-bolt V-band coupling at upper end of valve (Ref. 20-36-01). Slide coupling up onto duct.

(5) Work seal free of duct flange, and remove valve from aircraft with seal attached.

R (6) Remove band clamp securing seal to valve and remove seal and clamp from valve.

(7) Install protective caps on exposed ends of ducts and valve.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Remove protective caps from ends of ducts and valve, wipe mating surfaces clean, and verify duct and valve flanges are undamaged. Repair or replace damaged components.

(2) Verify single T-bolt V-band coupling is on duct above valve position and band clamp on duct below valve position.

(3) Lightly lubricate interior of seal and install seal on valve inlet flange.

(4) Install band clamp securing seal to valve. Torque clamp 50 to 60 lb in.

(5) Install valve, working seal onto valve inlet duct below valve position.

(6) Install single T-bolt V-band coupling at upper end of valve (Ref. 20-36-01).

(7) Install band clamp securing seal to valve inlet duct. Torque clamp 50 to 60 lb in.

R (8) Remove WARNING tags installed in Paragraph 4.

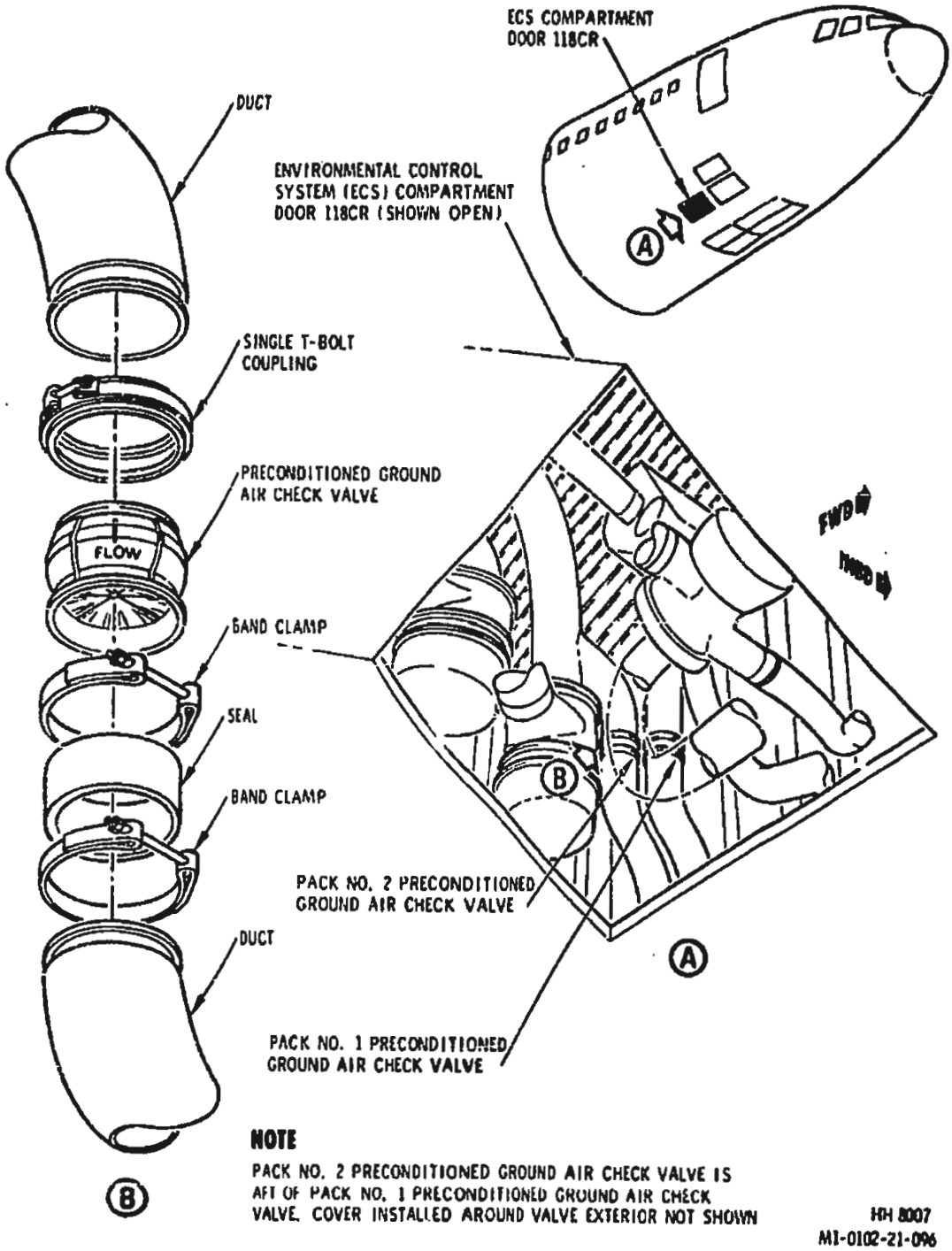
(9) Turn on air conditioning system (Ref. 21-00-00).

(10) Operate applicable air cycle system and check valve and duct connection for leakage and valve for complete closure.

(11) Turn off air conditioning system (Ref. 21-00-00).

(12) Install valve cover removed in Step 4A(2).

(13) Close ECS compartment access door.


ECS COMPARTMENT DOOR 118CR
DUCT
ENVIRONMENTAL CONTROL SYSTEM (ECS) COMPARTMENT DOOR 118CR (SHOWN OPEN)
SINGLE T-BOLT COUPLING
PRECONDITIONED GROUND AIR CHECK VALVE
FLOW
BAND CLAMP
SEAL
BAND CLAMP
DUCT
PACK NO. 2 PRECONDITIONED GROUND AIR CHECK VALVE
PACK NO. 1 PRECONDITIONED GROUND AIR CHECK VALVE
FWD
INBD
A
B
NOTE
PACK NO. 2 PRECONDITIONED GROUND AIR CHECK VALVE IS AFT OF PACK NO. 1 PRECONDITIONED GROUND AIR CHECK VALVE. COVER INSTALLED AROUND VALVE EXTERIOR NOT SHOWN
HH 8007
MI-0102-21-096

R
R
R Preconditioned Ground Air Check Valves
Removal and Installation
Figure 401

EFFECTIVITY: ALL

0018

AIR TURBINE MOTOR PRIORITY PRESSURE SWITCH REMOVAL AND INSTALLATION

1. General

The Air Turbine Motor (ATM) priority pressure switch is available in two (2) actuating pressure closing ranges, 12.5 to 13.5 psig and 15 to 16 psig. The closing range of 15 to 16 psig is the preferred spare.

2. Equipment and Materials

Protective caps

3. Referenced Procedure

	6-40-00	Exterior Access Doors and Panels, Zone 100
	21-00-00	Air Conditioning System - Maintenance Practices
R	29-11-00	Hydraulic Power System - Maintenance Practices
R	49-00-01	Auxiliary Power Unit (APU) - Adjustment and Test

4. Removal/Installation

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

(2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breakers ATM PUMP CONT & IND - SYS B (L13) and SYS C (L19).

(3) Open access panel 142DB (Ref. 6-40-00).

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES; USE PROTECTIVE GLOVES WHEN REQUIRED.

(4) Disconnect electrical cable connector from switch (Ref. Fig. 401).

(5) Install protective cap on end of electrical cable connector.

(6) Disconnect tubing nut and slide nut back on tubing.

(7) Remove mounting nut and washer from switch.

(8) Remove switch by sliding away from tubing and out of mounting clip.

(9) Install protective covers on tubing and on threaded coupling.

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(3) Remove protective cap from tubing and from threaded coupling.

(4) Position switch in mounting clip and install retaining washer and nut.

(5) Align tubing with switch and connect coupling nut.

(6) Remove protective caps and connect electrical cable connector to switch receptacle.

(7) Remove tags installed in Paragraph 4A.

R C. Test

R (1) Operate APU in minimum mode (Ref. 49-00-01).

R (2) Using APU bleed air, pressurize crossbleed manifold.

R (3) Verify No. 2 pack flow control valve is open.

R (4) Operate B2 and C2 ATM's (Ref. 29-11-00).

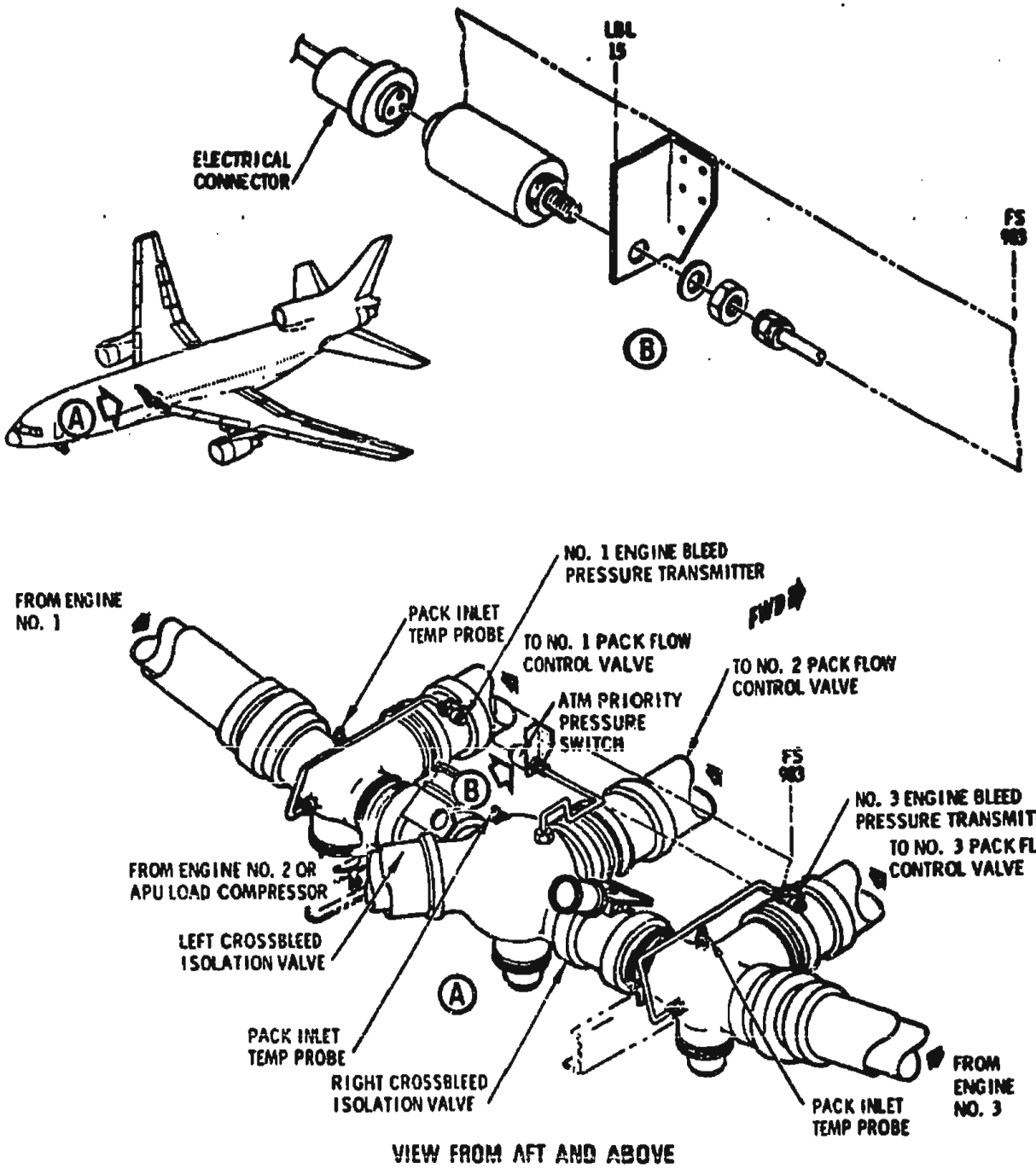
R NOTE: Operating ATM's off of APU bleed air should
R cause sufficient pressure drop to activate ATM
R priority pressure switch.

R (5) Verify No. 2 pack flow control valve closes, flow bar
R off.

R (6) Shut off B2 and C2 ATM's (Ref. 29-11-00).

R (7) Shut off APU (Ref. 49-00-01).

R (8) Close and secure access panel.



M1-0002-21-216

Air Turbine Motor Priority Pressure Switch
Removal and Installation
Figure 401

ECS SUPPLY BLEED AIR CLEANER - REMOVAL AND INSTALLATION

1. General

ECS supply bleed air cleaners are installed in each pack supply duct, downstream of the pack flow control valve. Access to the cleaners is through forward cargo floor access panels 124AT and 124BT (Ref. 6-50-00).

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

6-50-00	Interior Access Doors and Removable Panels
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
25-52-00	Cargo Handling Equipment - Removal and Installation
53-24-01	Forward Cargo Compartment Floor Panels - Removal and Installation

4. Removal/Installation

R A. Removal

NOTE: Removal and installation of the cleaners are best accomplished when all components in that system are at ambient air temperature. If procedure must be accomplished when components are above ambient, the replacement cleaner must be installed immediately after cleaner removal to avoid elongation of space between duct ends due to ducts cooling.

R R R R (1) Tag Flight Engineer/Second Officers bleed air and APU control panels and the three high-pressure ground air connections to prvent system operation until completion of procedures.

R R (2) Enter forward cargo compartment and remove the applicable forward container rollers, guides and stops

as required to gain access to flow panels (Ref. 25-52-00).

WARNING: Recent operation of aircraft pneumatic system will require precautions against high temperatures; use protective gloves when required.

(3) Remove forward cargo compartment floor panels 124AT and 124BT (Ref. 53-24-01).

(4) Locate supply (bleed) air cleaners between FS469 and FS489 (Ref. Fig. 401).

(5) Remove supports on bleed air area overheat sensors from applicable duct, and move sensors gently aside to prevent damage to sensors.

(6) Disconnect overboard purge lines as required. For Pack NO. 1 cleaner (left-hand side) it may be necessary to disconnect all three purge lines, because the cleaner is under the purge lines.

(7) Disconnect purge line from the applicable cleaner. Install protective caps on purge air line openings.

(8) Remove insulation from clamps at both ends of the cleaner.

(9) Support cleaner, remove single T-bolt V-band couplings from both ends of the cleaner (Ref. 20-36-01), and remove cleaner.

(10) Install protective caps on duct opening.

B. Installation

(1) Remove protective caps from duct opening and purge air lines.

R
R CAUTION: ARROW ON CLEANER DENOTING DIRECTION OF FLOW SHOULD POINT FORWARD.

CLEANER PURGE LINE BOSS CENTER LINE IS HORIZONTAL.

PURGE LINES ARE ALIGNED WITHIN ±5 DEGREES AT EXPANSION BELLOWS (MUFFLER).

(2) Place cleaner with insulation in position with arrow pointing forward. Loosely install coupling (Ref. 20-36-01) at both ends of cleaner.

(3) Align purge line boss (horizontally) with the purge line and connect purge line to the cleaner.

(4) Tighten coupling at both ends of the cleaner.

(5) R Connect purge line of the other cleaners if they were disconnected in Step 4A(6).

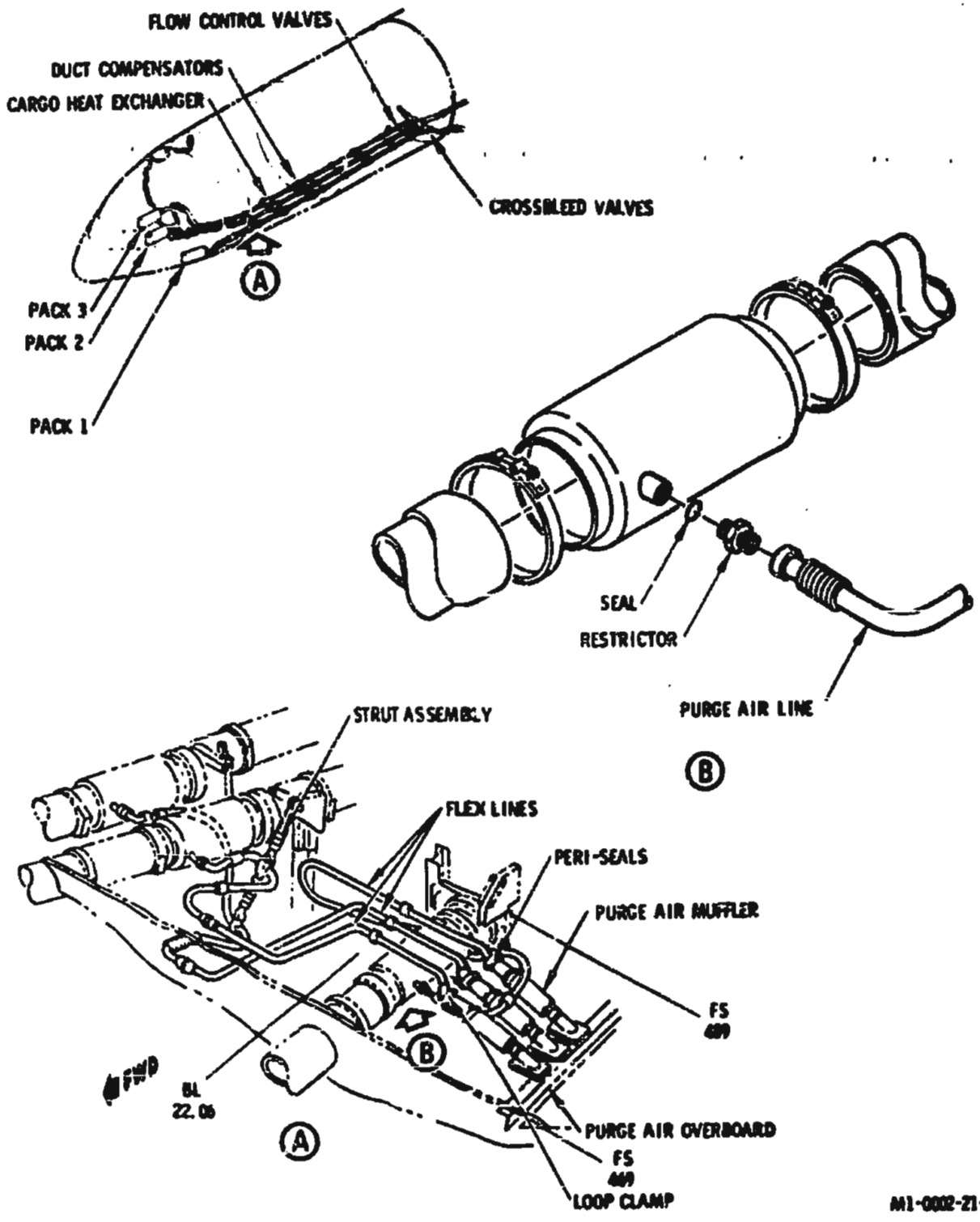
(6) Gently move overheat sensors into position and install sensor supports if removed.

(7) Operate applicable air cycle system (Ref. 21-00-00) and check all disturbed connections for leaks.

(8) Install insulation over clamps on both ends of the cleaner [removed in Step 4A(6)].

(9) R Install forward cargo floor panels (Ref. 53-24-01) removed in Step 4A(2).

R (10) Remove WARNING tags installed in Paragraph 4A(1).



Bleed Air Cleaner - Removal and Installation
Figure 401

OZONE CATALYTIC CONVERTER REMOVAL AND INSTALLATION

1. General

The ozone catalytic converters are installed in each pack high pressure bleed supply duct, just forward of the air cleaner, zone 124. Access to the ozone catalytic converters is through forward cargo floor access panels 124AT and 124BT (Ref. 6-50-00).

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

6-50-00	Interior Access Doors and Removal Panels
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
25-52-00	Cargo Handling Equipment - Removal and Installation
53-24-01	Forward Cargo Compartment Floor Panel - Removal and Installation

4. Removal/Installation

NOTE: Removal and installation of the ozone catalytic converters should be accomplished when all components in that system are at ambient air temperature. If procedure must be accomplished when components are above ambient temperature, the replacement converter must be installed immediately after converter removal to avoid elongation of space between duct ends due to ducts cooling.

A. Removal

(1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections to prevent operation of the pneumatic system until completion of procedures.

(2) Enter forward cargo compartment and remove the applicable forward container rollers, guides and stops as required to gain access to floor panels (Ref. 25-52-00).

(3) Remove the forward cargo compartment floor panels 124AT and 124BT (Ref. 53-24-01).

(4) Locate ozone catalytic converter between FS449 and FS469, just forward of air cleaner (Ref. Fig. 401).

NOTE: No. 2 right inboard catalytic converter must be removed prior to removing No. 3.

WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES.

USE PROTECTIVE GLOVES WHEN NECESSARY.

(5) Remove insulation around the couplings at each end of the converter.

(6) Support converter, remove coupling cover with single T-bolt V-band couplings from each end of the converter and remove converter (Ref. 20-36-01).

(7) Install protective caps on duct opening.

B. Installation

(1) Verify tags previously installed on FE/SO ENGINE BLEED CONTROL and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Remove protective caps from duct opening.

NOTE: No. 3 right outboard catalytic converter must be installed prior to installing No. 2.

(3) Place converter with insulation in position with arrow pointing forward. Install single T-bolt V-band coupling and covers on each end of the converter removed in Step 4A(6).

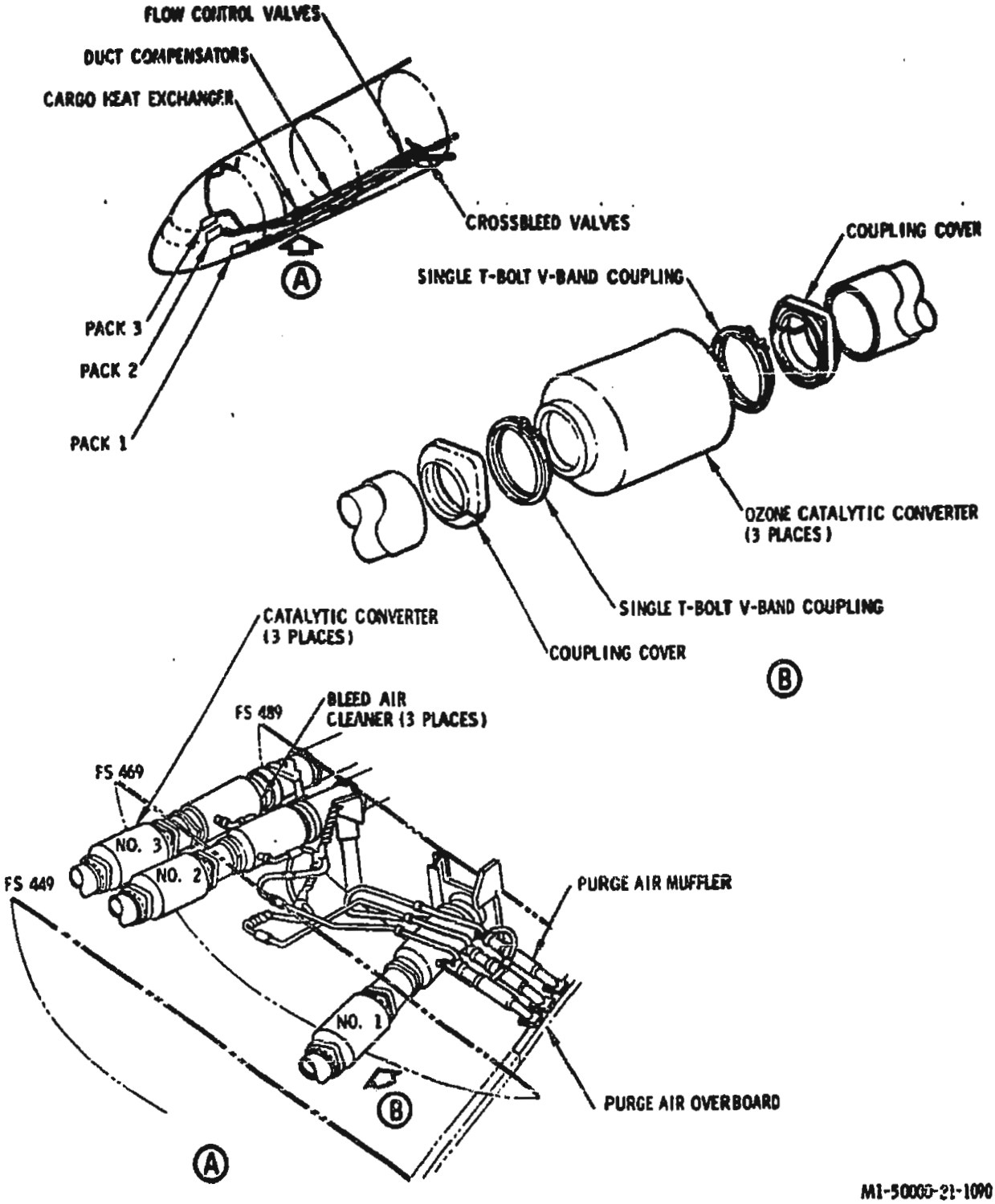
(4) Operate applicable air cycle system (Ref. 21-00-00) and check all disturbed connections for leaks.

(5) Install applicable insulation around each coupling and cover, removed in Step 4A(5).

(6) Install forward cargo compartment floor panel, removed in Step 4A(3).

(7) Install forward cargo floor equipment, removed in Step 4A(2).

(8) Remove warning tags, installed in paragraph 4A(4).



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Ozone Catalytic Converter - Removal and Installation
Figure 401

ECS SUPPLY PURGE AIR SYSTEM - REMOVAL AND INSTALLATION

1. General

ECS supply (bleed) overboard Purge Lines and Mufflers are installed between packs 1, 2 and 3 bleed air cleaners and overboard vents (Ref. Fig. 401). Access to the lines and mufflers is through the forward cargo floor access panels 124AT and 124BT (Ref. 6-50-00).

R 2. Equipment and Materials

R Silicon tape, Fed Spec MIL-I-19166 or equivalent

R Silicon sealant, GE-RTV-157 or equivalent

R Anti-seize Compound, general purpose, Fed Spec TT-A-580 or
R equivalent.

R 3. Referenced Procedures

	6-50-00	Interior Access Doors and Removable Panels
	21-00-00	Air Conditioning System - Maintenance Practices
R	36-22-00	Bleed Air Area Overheat Warning System - Adjustment
R		and Test
R	36-22-02	Area Overheat Sensors - Removal and Installation
	53-24-01	Forward Cargo Compartment Floor Panels - Removal and Installation

R 4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officer (FE/SO) ENGINE BLEED
R CONTROL and APU CONTROL panels and three high-pressure
R ground air connections to prevent pneumatic system
R operation until completion of procedures.

R (2) Remove forward cargo compartment floor panels 124AT and 124BT (Ref. 53-24-01).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES; USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (3) Locate purge lines and mufflers between FS469 and FS489
R (Ref. Fig. 401).

R (4) Remove supports on bleed air area overheat sensors from
R applicable duct, and move sensors gently aside to
R prevent damage to sensors.

R (5) Remove insulation as needed.

R (6) Remove loop clamps and strut assembly from flex lines
R (Ref. Fig. 401).

R (7) Disconnect flex lines from cleaners, bulkhead unions;
R etc.

R (8) Remove muffler clamps.

R CAUTION: ON PERI-SEALS THE INTEGRAL CABLES ARE NOT TO BE
R REMOVED UNDER ANY CIRCUMSTANCES. IF SEALS FAIL,
R ENTIRE TUBE ASSEMBLY MUST BE REMOVED FROM AIRPLANE
TO BE REPAIRED. SLACK CABLES ARE ACCEPTABLE.
TIGHT CABLES ARE NOT ALLOWED TO CONTACT ANY PART
OF THE FITTING EXCEPT WHERE SAFETY WIRED (REF.
FIG. 401).

(9) Remove mufflers and seals.

R NOTE: No protective caps are needed.

B. Installation

CAUTION: CLEANER PURGE LINE BOSS CENTER LINE MUST BE HORIZONTAL.

PURGE LINES ARE ALIGNED WITHIN ±5 DEGREES AT EXPANSION BELLOWS (MUFFLER).

R NOTE: Apply anti-seizing compound to threads of mufflers and flex line fittings before installation.

(1) Install mufflers and seals (3 places) and torque 360 to 400 lb. in.

(2) Install loop clamps over muffler.

NOTE: At this point, coordinate installation of flex lines and duct heat sensors, to assure easiest

installation of heat sensors for bleed air system.

(3) Align purge line boss (horizontally) with the purge line and connect purge line to cleaner.

(4) Install flex lines. *Do not torque fittings.*

R (5) Install two layers of insulation over three mufflers,
R all purge lines between mufflers and centerline web.
R Do not insulate purge line expansion bellows.

R (6) Spiral wrap insulation with silicon tape overlapped
R 0.25 to 0.38 inch.

R WARNING: DO NOT ALLOW SEALANT TO CONTACT EYES. PROLONGED
R EXPOSURE MAY RESULT IN EYE IRRITATION.

R (7) Seal ends of tape with silicon sealant.

R (8) Verify that no flex line bellows has an angular
R displacement greater than ±5 degrees.

R (9) Verify flex lines are properly positioned for
R installation of loop clamps at LBL22 (Ref. Fig. 401).

R (10) Torque flex line fitting at bulkhead union enough to
R prevent leakage. Torque remaining flex line fittings
R 1125 lb. in. minimum to 1175 lb. in. maximum.

R (11) Install clamps around flex line and tube assembly and
R attach to strut assembly with bolt, washer and nut
R (Ref. Fig. 401).

R (12) Adjust strut assembly so there is no preload on flex
R line and misalignment at bellows does not exceed ±5
R degrees. Install safety wire to secure strut assembly.

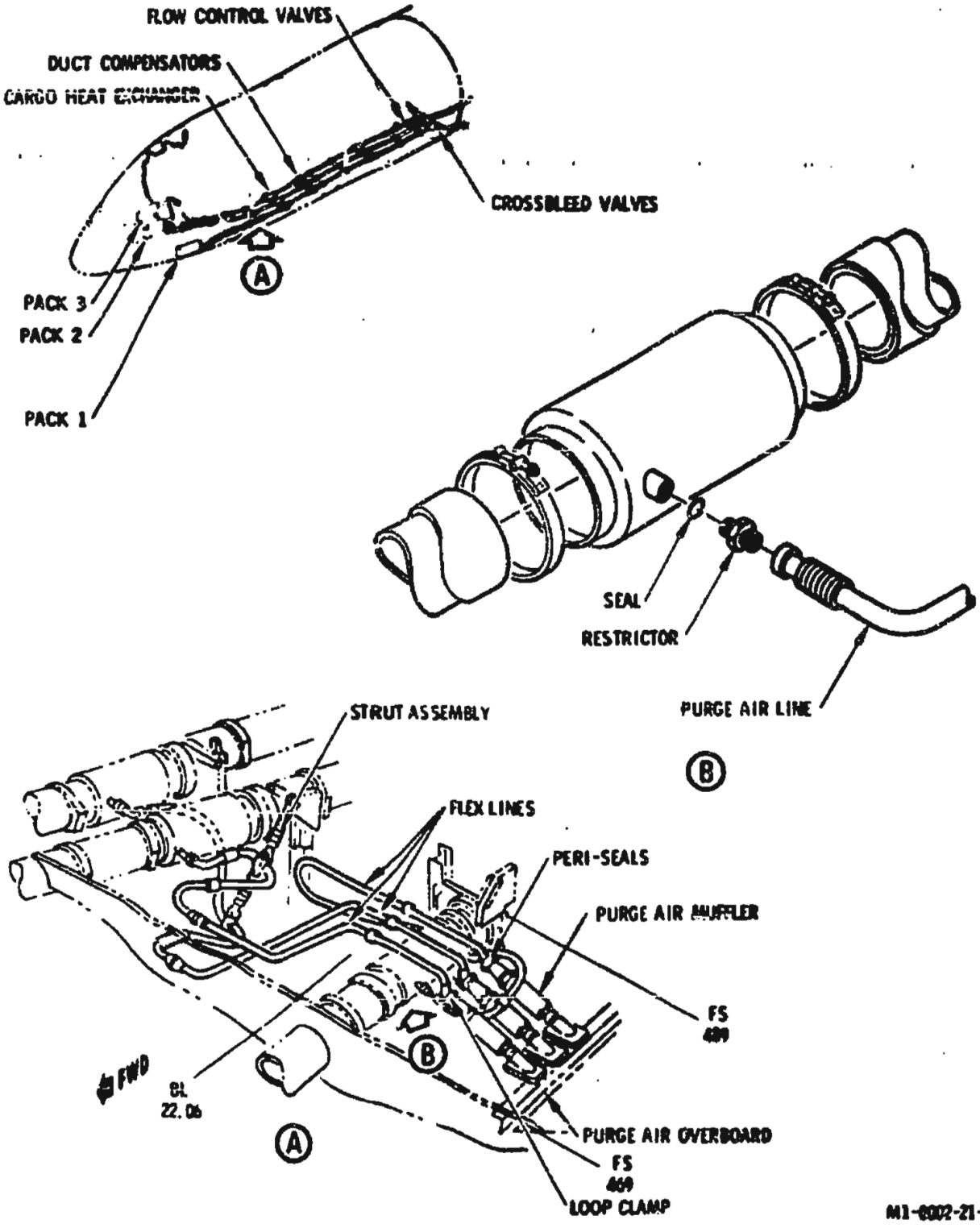
R (13) Route overheat sensors to structure mounts (not on
R ducts) and connect to terminal joints.

R (14) Check out electrical functions of sensors to insure
R continuity (Ref. MM 36-22-00 and 36-22-02).

R (15) Operate applicable air cycle system (Ref. 21-00-00) and
R check all disturbed connections for leaks.

R (16) Install forward cargo floor panels (Ref. 53-24-01)
R removed in Step 4A(2).

R (17) Remove warning tags installed in Step 4A(1).



Overboard Purge Lines and Mufflers - Removal and Installation
Figure 401

CR ECS SUPPLY PURGE AIR SYSTEM - CLEANING AND PAINTING

CR 1. General

CR A. ECS supply (bleed) Overboard Purge Lines and Mufflers are
CR installed between packs 1, 2, and 3 bleed air cleaners and
CR overboard vents.

CR B. The overboard vents are located on the left fuselage between
CR FS469 and FS489 (Ref. Figure 701).

CR 2. Referenced Procedures

CR	21-51-00	Air Conditioning System-Maintenance Practices
CR	21-21-38	ECS Supply Purge Air System-Removal and Installation
CR	36-13-00	High-Pressure Ground Air System
CR	49-00-00	APU, Maintenance Practices

CR 3. Tools/Equipment

CR Eye Protection - Goggles

CR Hand Protection - Gloves

CR 4. Operational Check

CR A. Establish air flow through system by operating APU, (Ref.
CR Maintenance Manual 49-00-00) or connecting high pressure
CR ground cart or shop air (Ref. Maintenance Manual 36-13-00).

CR B. Operate air cycle machines (Ref. Maintenance Manual
CR 21-51-00).

CR NOTE: Operate air cycle machines to AUTO mode to avoid
CR icing of water separators.

CR WARNING: BLEED AIR AND ALL METAL PARTS OF BLEED AIR SYSTEM ARE
CR HOT. WEAR EYE PROTECTION WHEN CHECK AIR FLOW FROM
CR OUTLETS.

CR C. Verify that air is flowing from the three air outlets.
CR There should be a pronounced outflow of air.

CR D. Poor or no flow is indication of plugged purge lines.
CR Continue with procedure if plugged purge lines are found.

CR 5. Cleaning

CR A. Gain access to applicable plugged system (Ref. 21-21-38).

CR B. Remove purge lines and clean as required to establish
CR satisfactory air flow.

CR NOTE: Start at elbow nearest the bleed air cleaner.

CR C. Reinstall purge lines (21-21-28) and leak check.

CR (1) Using a soap solution, check for leaks at purge line
CR connections and fittings as follows:

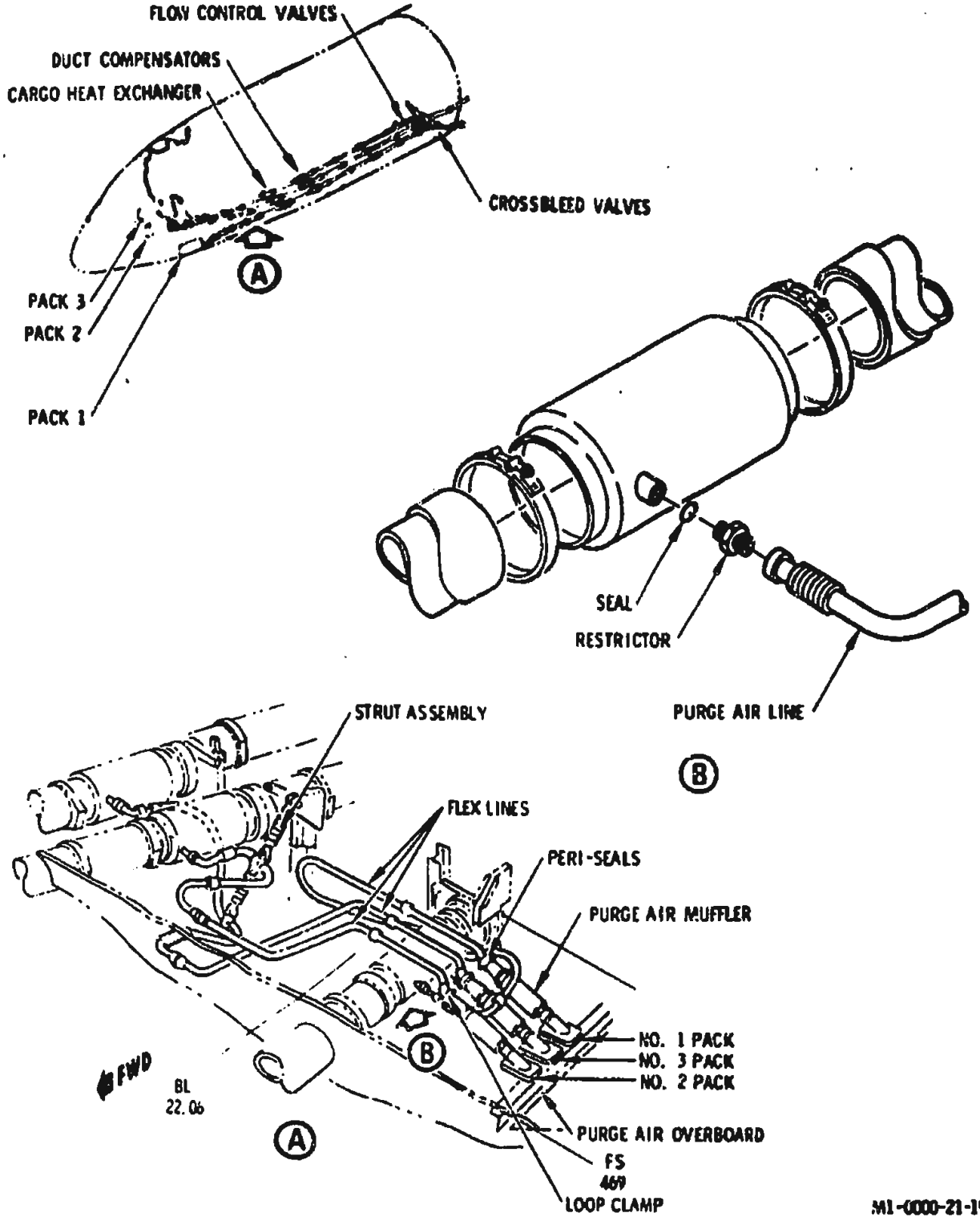
CR (2) Only slow bubbling is permissible.

CR (3) Check all bubbling areas by feel for a leak.

CR (4) Any leak that can be detected by feel must be
CR eliminated.

CR WARNING: FAILURE TO ELMINATE LEAKS WILL CAUSE AN
CR OVERHEAT IN THE AREA.

CR 6. Return aircraft to normal (Ref. 21-21-38).



CR Overboard Purge Lines and Mufflers - Cleaning and Painting
CR Figure 701

R EFFECTIVITY: ALL
R
001B

R FLIGHT STATION SYSTEM - DESCRIPTION AND OPERATION

R 1. General

CR The flight station distribution system includes the ducting and components from the supply source through the several air outlets into the flight station. Supply air is taken from the cold air plenum (Ref. 21-51-00) and the hot air manifold (Ref. 21-41-00) in the forward electronic service center, zone 113. The supply air is temperature-controlled to flight station requirements by the zone trim control system (Ref. 21-61-00). The quantity of mixed airflow is controlled by the flight station supply airflow control valve. The flow rate of this valve can be remotely controlled from Flight Engineer/Second Officers station to a low flow rate of 225 to 325 CFM by pulling the knob FLIGHT STATION AIR SUPPLY. When the control knob is pushed in, the supply air flow rate from the valve is increased to 360-425 CFM.

R Downstream (forward) of the flow control valve the supply duct branches into two ducts. The ducts cross the ceiling of the forward electronic service center to both outboard sides. The left duct goes forward to a point below the left aft outboard corner of the flight station. At this point, the left duct branches to a smaller duct going forward and a vertical riser. The duct going forward turns upward to a long discharge grille below the two left side windows. Near the top of the flight station the riser branches to supply the Captains, First Observers and Second Observers individual air outlets (Ref. Fig. 1).

R The right duct goes forward to a point below the right aft outboard corner of the flight station. At this point, the right duct branches to a smaller duct going forward and a vertical riser. The duct going forward turns upward to a long discharge grille below the two right side windows. The riser supplies the First Officers and Flight Engineer/Second Officers individual air outlets and the flight station overhead outlets.

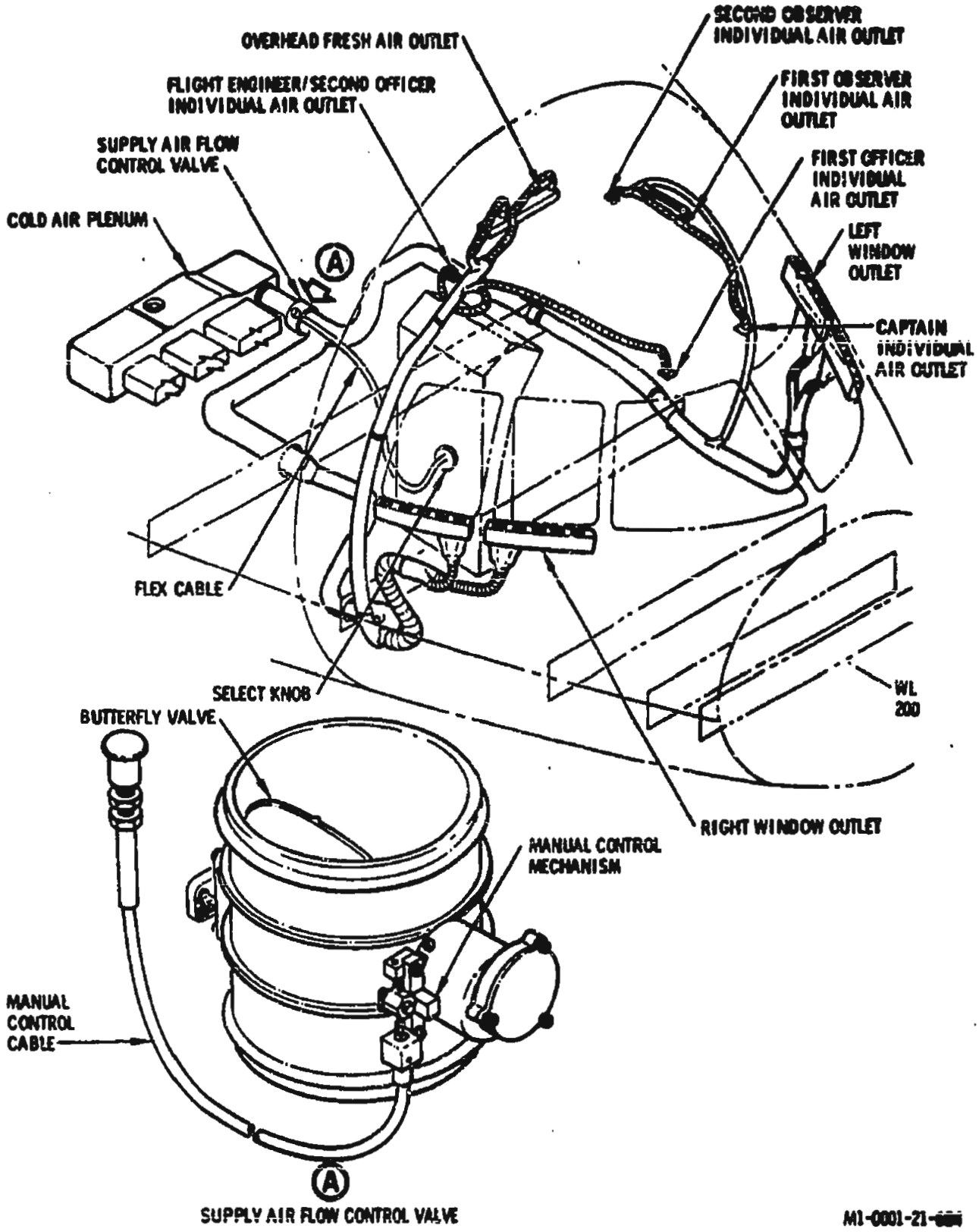
R Flight station exhaust air goes through floor-level openings and panel cooling ducting to the forward electronic service center, where it is used for compartment and equipment cooling (Ref. 21-25-00).

R 2. Supply Air Flow Control Valve

CR The flight station supply airflow control valve is a 6-inch diameter, unbalanced, disc-type flow control valve. A cable control (Ref. Fig. 2) is used to manually adjust butterfly valve

CR to a high flow or low flow mode. The disc is unbalanced in that
CR the shaft upon which it rotates attaches to the disc at an
CR off-center position, providing unequal valve plate areas on the
CR two sides of the shaft. The disc and shaft assembly are
CR spring-loaded to the valve-open position. The valve is test
CR bench calibrated, and spring force is adjusted to provide a
CR controlled airflow of 360-425 CFM in high flow mode and 225-325
CR CFM in low flow mode. The manual control for this valve is at
CR the Flight Engineer/Second Officers station. The valve is in
CR high flow mode when the control knob FLIGHT STATION AIR SUPPLY
CR is pushed. By pulling the control knob the flow is reduced to
CR the low flow mode.

CR The valve is used to control flow of conditioned air to the
CR flight station distribution system. The valve is installed in
CR the top right of the forward electronic service center, zone
CR 113.

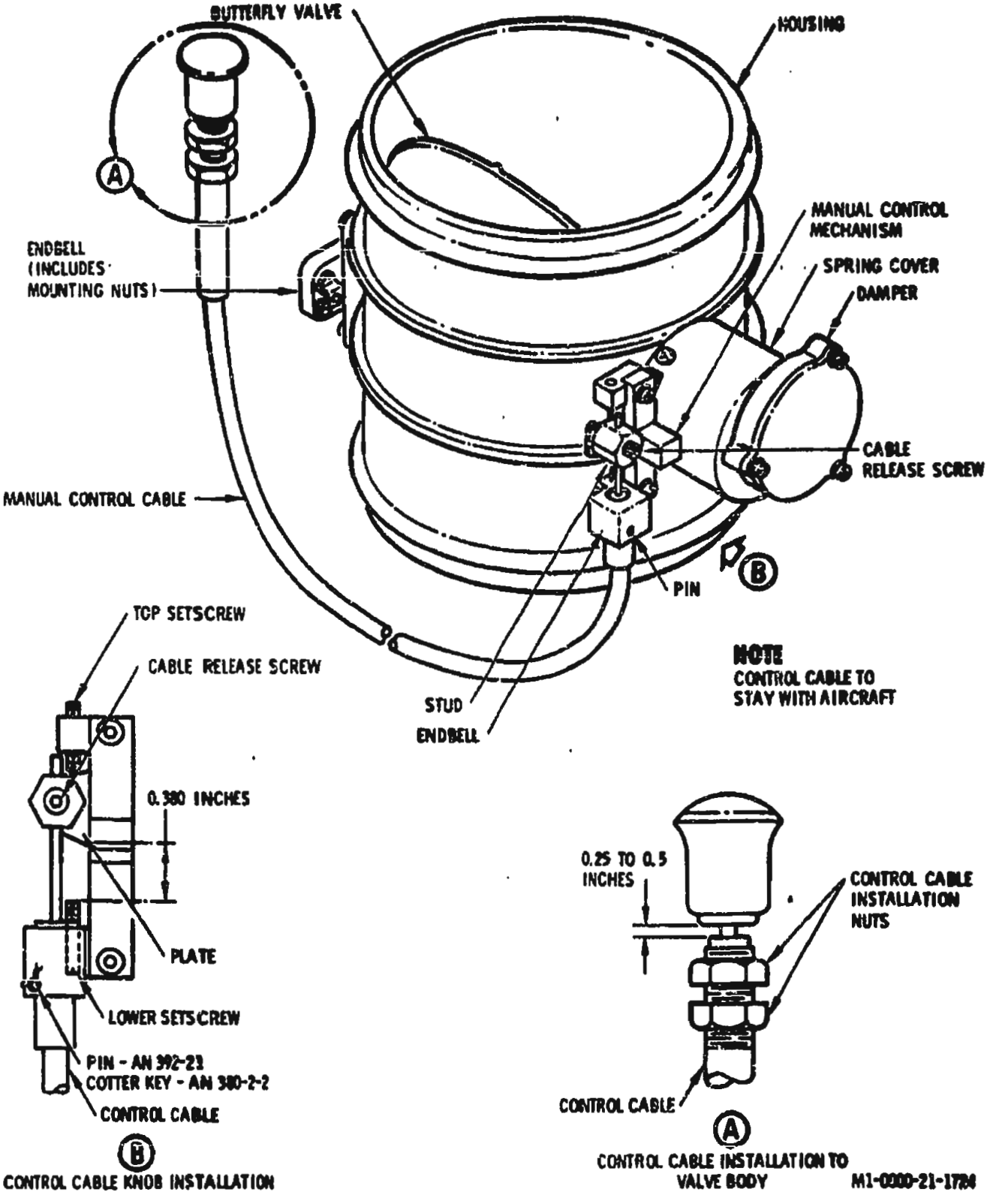


CR
CR

Flight Station Supply Air System
Figure 1

EFFECTIVITY: ALL

002B



C Flight Station Supply Air Flow Control Valve
C Figure 2

R FLIGHT STATION SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting flight station system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the flight station system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

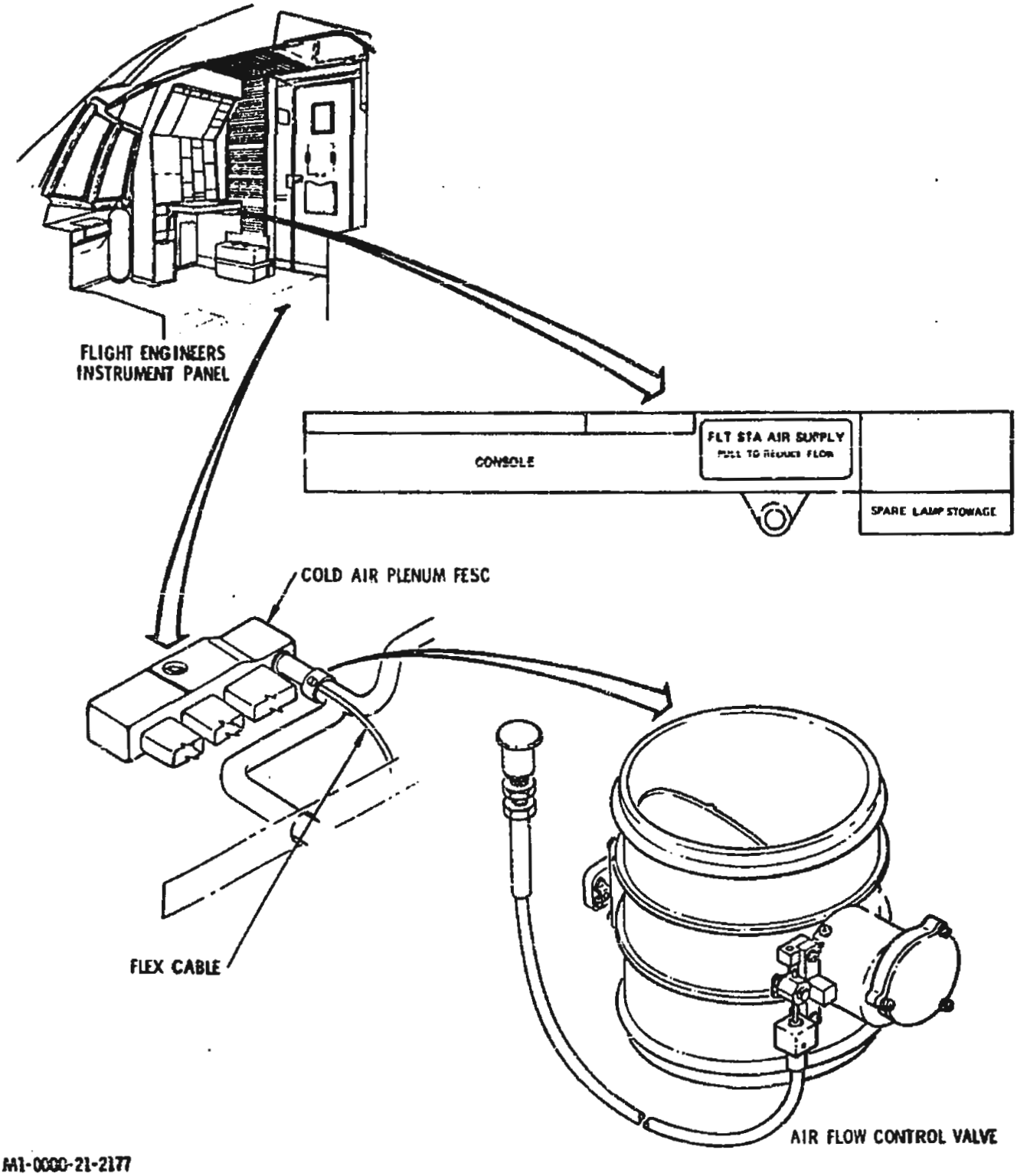
FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
103	Flight Station Noisy Air Supply

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CABLE – MANUAL CONTROL	1	FESC/FESO CONSOLE	21-22-01
KNOB – CONTROL FLT STA AIR SUPPLY	1	FESO CONSOLE/210	21-22-01
VALVE – CONTROL FLT STA COOLING	1	FESC/112AB	21-22-01

M1-0000-21-2176

R Component Location Index
R Figure 101

R EFFECTIVITY: ALL
R
001B



R
R

Component Locator Diagram
Figure 102

R EFFECTIVITY: ALL
R
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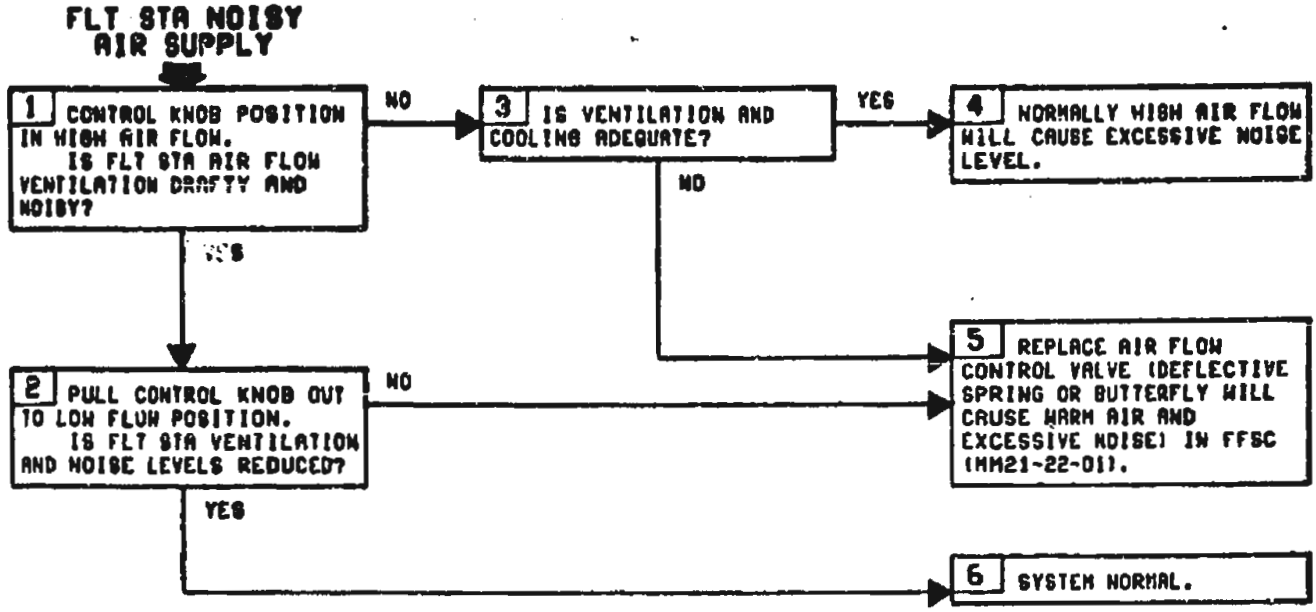
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
AIR CONDITIONING (MM21-00-00)
PNEUMATIC SYSTEM (MM36-00-00)


FLT STA NOISY AIR SUPPLY
1 CONTROL KNOB POSITION IN HIGH AIR FLOW. IS FLT STA AIR FLOW VENTILATION DRAFTY AND NOISY?
NO
3 IS VENTILATION AND COOLING ADEQUATE?
YES
4 NORMALLY HIGH AIR FLOW WILL CAUSE EXCESSIVE NOISE LEVEL.
NO
YES
5 REPLACE AIR FLOW CONTROL VALVE (DEFLECTIVE SPRING OR BUTTERFLY WILL CAUSE WARM AIR AND EXCESSIVE NOISE) IN FFSC (MM21-22-01).
2 PULL CONTROL KNOB OUT TO LOW FLOW POSITION. IS FLT STA VENTILATION AND NOISE LEVELS REDUCED?
NO
YES
6 SYSTEM NORMAL.

NOTE
HIGH AIR FLOW RATE 360-425 CFM
LOW AIR FLOW RATE 225-325 CFM

M1-0000-21-2178

R Flight Station Noisy Air Supply
R Figure 103

R EFFECTIVITY: ALL
R
001B

FLIGHT STATION SUPPLY AIR FLOW CONTROL VALVE REMOVAL AND INSTALLATION

1. Equipment and Materials

Duct covers

C PIN Per MS171528

C LOCKWIRE, MS20995C20

C SCREW, TASK CORP, P.O. BOX 3999, ANAHEIM, CALIF. 92803 MP
C NAS1352-06LL4P or equivalent.

2. Referenced Procedure

21-00-00 Air Conditioning System - Maintenance Practices

3. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

A. Removal

(1) Open forward electronic service center compartment door 112AB.

C (2) Remove cable release screw and release cable (Ref. Fig.
C 401).

C (3) Remove cotter pin and remove pin to separate control
C cable from endbell.

C (4) Remove insulation cover from valve (Ref. Fig. 402).

C (5) Remove hose clamps from both connector hoses.

C (6) Work hoses off valve onto ducts.

C (7) Manually support valve and remove tri-wing mounting
C screws.

C (8) Remove valve.

C (9) Cover ends of duct to prevent contamination.

B. Installation

(1) Remove covers from duct.

(2) Position valve on bracket and install mounting screws.

(3) Work hoses into position on valve.

(4) Install hose clamps and tighten.

CR (5) Locating the control cable, in the hole in stud, insert
CR control cable into hole in endbell assembly (Ref. Fig.
CR 401). Secure cable to the endbell with pin and install
CR cotter key.

CR (6) Align hole in stud parallel with cable and insert
CR cable.

CR NOTE: Do not secure cable release screw at this time.

CR (7) Move stud and plate as necessary to locate plate into
CR detent.

CR (8) Position control cable handle (in FLT. STA.) to
CR dimension shown in view "A" of figure 401.

CR (9) Tighten cable release screw to a torque of 11 to 14
CR pound inch.

CR (10) Adjust top screw until it touches the top of plate.

CR (11) Adjust lower setscrew to obtain a clearance as shown
CR in view "B", figure 401.

C. Operational check

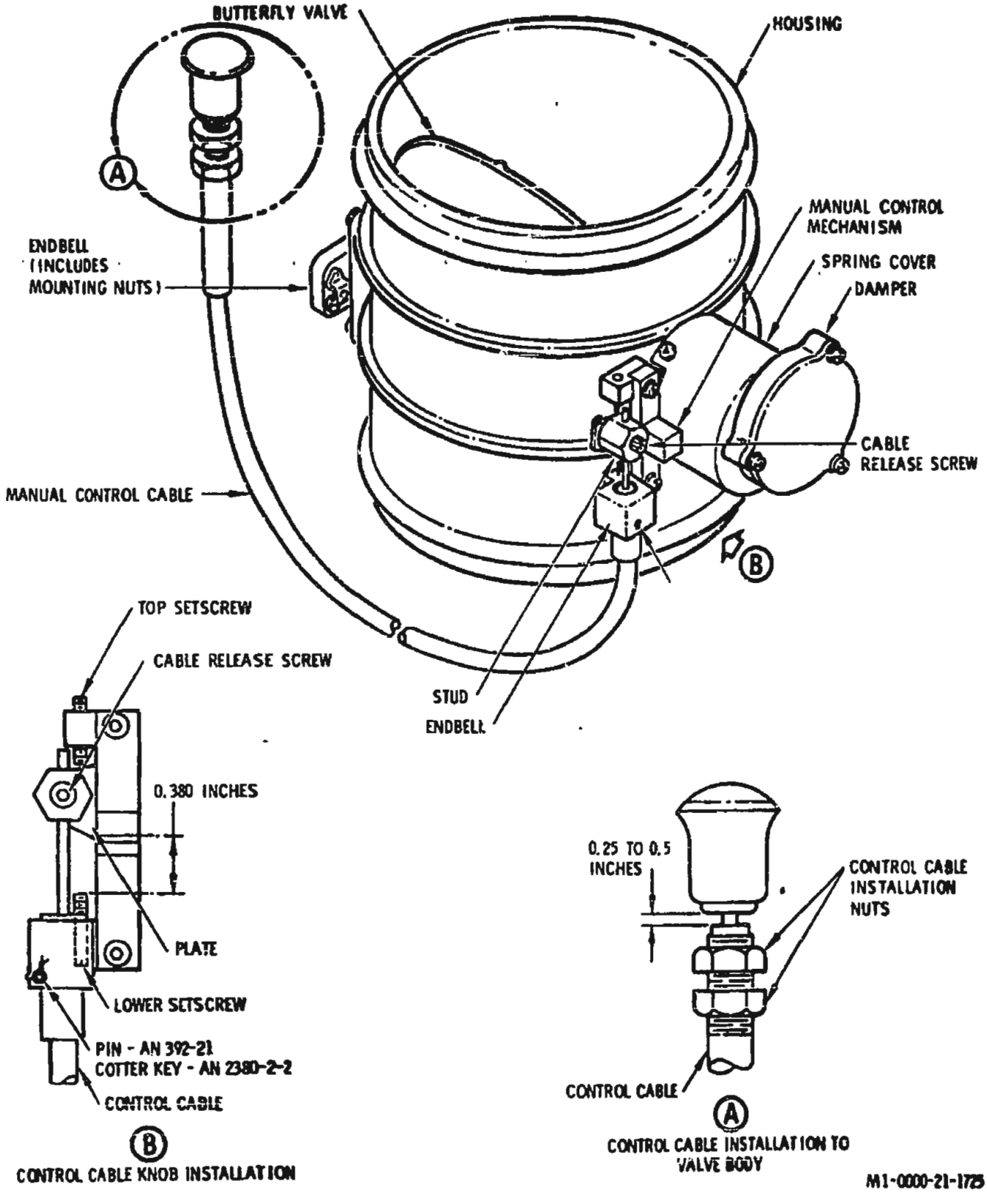
(1) Operate air conditioning system (Ref. 21-00-00) and check all disturbed connections for leakage and for air flow from flight station outlets.

C (2) Verify the flight station airflow is reduced when the
C knob (FLIGHT STATION AIR SUPPLY) is pulled and the flow
C increases when the control knob is pushed in.

C (3) Install insulation cover on valve.

C (4) Close compartment door.

C (5) Remove tags installed in Step 3.



CR Flight Station Supply Air Flow Control Valve - Removal and
CR Installation
CR Figure 401

CABIN SYSTEM - DESCRIPTION AND OPERATION

1. General

The cabin distribution system includes ducting and components from the supply air source through the cabin overhead and individual air outlets (if installed). There are three separate cabin air distribution ducting systems. One system supplies air to the forward cabin (FS 349 to 729), one to the mid cabin (FS 729 to 1243), and one to the aft cabin (FS 1243 to 1763).

2. Description

The three air packs in the system supply conditioned air through the cold air plenum to each of the three cabin zones, forward mid, aft, and to the flight station. Temperature for each zone is governed by the zone temperature controllers (Ref. 21-61-00) Pack 1 temperature controller receives inputs from all zones. Packs 2 and 3 receive inputs from the cabin zones only.

The quantity of airflow through each system is matched to the size of the area each serves through duct sizes (Ref. Fig. 1).

Three rectangular cabin air supply ducts from the cold air plenum and zone trim manifold go forward and turn outboard to the right side of the fuselage. At this point, the ducts turn upward as risers in the fuselage wall just forward of the right forward passenger door. At the top of the fuselage, the ducts change from rectangular to round and turn aft. The three ducts lie parallel along the top of the fuselage. The left duct supplies the aft cabin, the center duct supplies the forward cabin, and the right duct supplies the mid cabin. Air for the forward lavatories is taken from the mid and aft cabin ducts before they turn aft. As the three overhead supply ducts go aft, the left and right ducts raise above the center duct. Duct air temperature sensors (Ref. 21-61-00) and duct air temperature probes (Ref. 21-63-00) for the forward cabin are installed in
R the center duct at FS 436, Zone 233. The mid and aft cabin
R sensors and probes are installed in the appropriate ducts at FS
R 543, Zone 234.

At about the mid point in the forward cabin the center duct branches into short cross-fuselage ducts. These ducts take the air to the two overhead distribution ducts. The distribution ducts then go forward and aft to each end of the forward cabin area. The overhead distribution ducts supply air directly to the overhead cabin aspirators and to the inboard passenger individual air outlets (Ref. Fig. 2). Two lateral ducts branch

outboard from each distribution duct to supply air to the outboard passenger individual air outlets.

The left overhead supply duct branches into two overhead distribution ducts at the forward end of the mid cabin. The distribution ducts go aft to the aft end of this area, directly in line with the ducts in the forward and aft cabin areas. The right supply duct branches at the forward end of the aft cabin, and the distribution ducts go aft to the end of the cabin. At the aft end of these ducts, smaller ducts take air to the aft lavatories. Cabin aspirator and individual air outlet supplies in the mid and aft cabin areas are the same as in the forward
R cabin, except for three lateral ducts in each area.

3. Operation

The cabin aspirators are long, rectangular jet pump assemblies with multiple jet nozzles (Ref. Fig. 3). The aspirators, which are installed directly below the distribution ducts, connect to rectangular openings in the bottom of these ducts. Fresh air discharging from the nozzles draws air through grilled ceiling areas outboard of the aspirators. Aspirator discharge through horizontal openings (slots) in the ceiling below them is a one-to-one mixture of fresh and recirculated air. The aspirator system increases cabin air circulation, prevents air near the ceiling from becoming stale, and prevents discharge of moisture.

The passenger individual air outlets (one for each seat) are part of the overhead passenger service modules (Ref. 25-22-00). Each outlet is positioned (during installation) to direct discharge air to a specific seat. Seat switches electrically control airflow from each outlet through the passenger service system (Ref. 23-33-00). The switches can be set to closed, half open, or full open.

The air cycle pack water separators usually remove sufficient moisture from the conditioned air so that condensation in the ducts is not a concern. However, under certain operating conditions considerable water may condense on the duct surfaces and must be drained. The condensate drain system collects this water and drains it overboard. The drain system has small diameter plumbing lines leading from the low points of the overhead cabin air distribution ducts, down the cabin side walls, into the potable water drain system (Ref. 38-32-00). This system leads overboard through two drain masts (Ref. Fig. 4 and 5).

Another similar drain system drains moisture from the lower ducts of the ECS drain system and from the cold air plenum (Ref. Fig. 6).

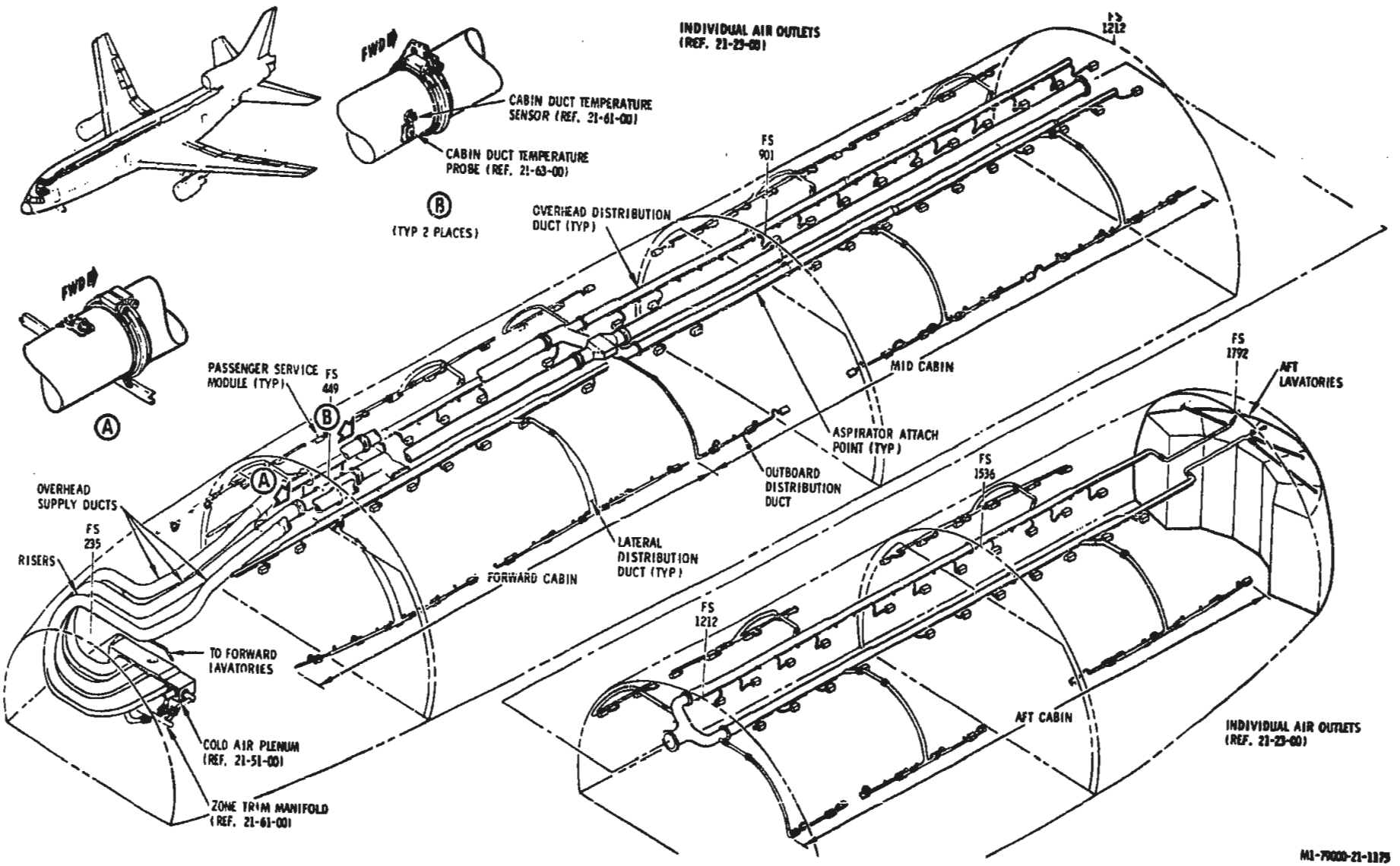
On aircraft 001-023 without SB21-094,
this system leads overboard to the forward drain mast.

On aircraft 001-023 with SB21-094, and 024-999,
this system drains to the lower fuselage area pressure shell drain.

Each drain line from the overhead cabin to the drain masts has in line a floating ball valve just upstream of the junction with the potable water drain system.

On aircraft 001-023 without SB21-094,
the drain system for the lower ECS distribution ducts and cold air plenum has an in-line floating ball valve upstream of the junction with the potable water system.

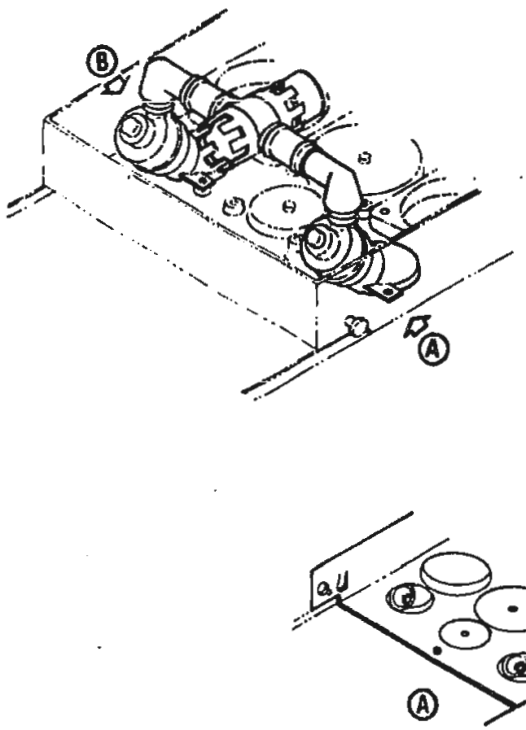
These valves prevent loss of air through the drain system during pressurized flight. When the cabin is pressurized, the ball in the valve is held on the valve seat, even with water present. When cabin differential pressure is low, the ball floats on any water present, opening the valve. Thus the valve can open at low altitudes when cabin differential pressure is low, which is when condensation usually occurs.

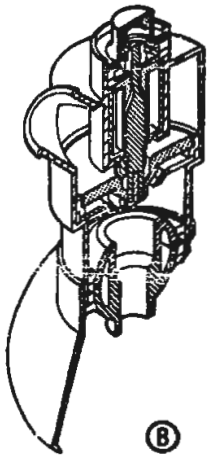


R
R Cabin Supply Air System
Figure 1

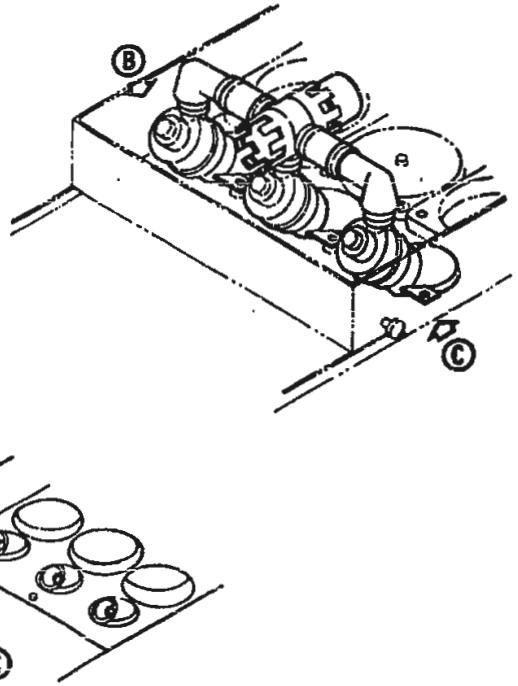
EFFECTIVITY: ALL

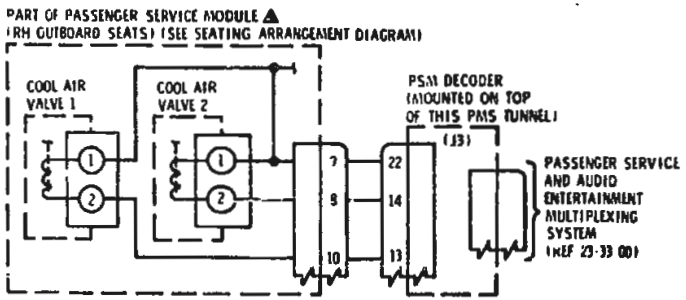
001B

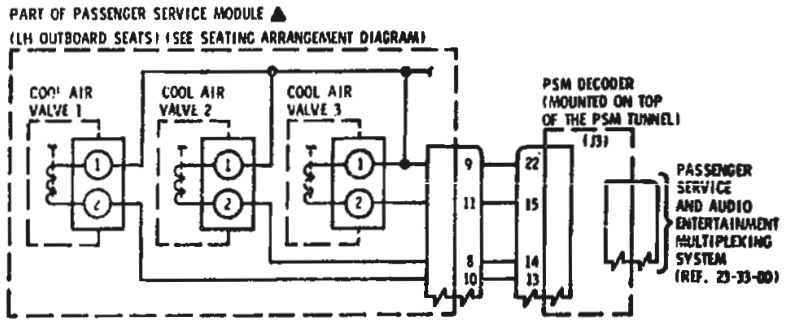




VALVE CROSS SECTION



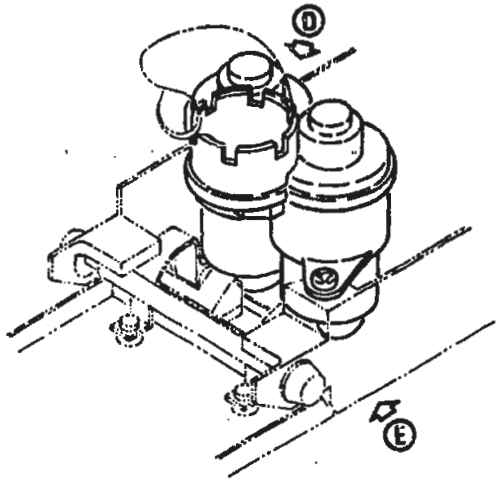

PART OF PASSENGER SERVICE MODULE ▲
(RH OUTBOARD SEATS) (SEE SEATING ARRANGEMENT DIAGRAM)
COOL AIR VALVE 1
COOL AIR VALVE 2
PSM DECODER (MOUNTED ON TOP OF THIS PMS TUNNEL) (J3)
PASSENGER SERVICE AND AUDIO ENTERTAINMENT MULTIPLEXING SYSTEM (REF 23-33-00)

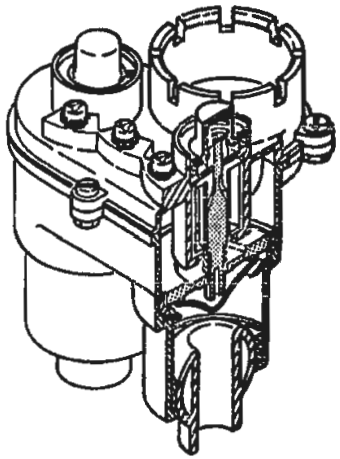

PART OF PASSENGER SERVICE MODULE ▲
(LH OUTBOARD SEATS) (SEE SEATING ARRANGEMENT DIAGRAM)
COOL AIR VALVE 1
COOL AIR VALVE 2
COOL AIR VALVE 3
PSM DECODER (MOUNTED ON TOP OF THE PSM TUNNEL) (J3)
PASSENGER SERVICE AND AUDIO ENTERTAINMENT MULTIPLEXING SYSTEM (REF. 23-33-00)

G 857
MJ-0100-21-139

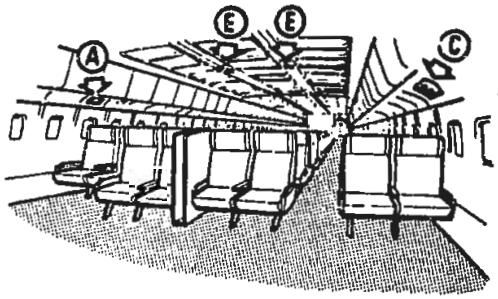
Individual Air Outlets
Figure 2 (Sheet 1)

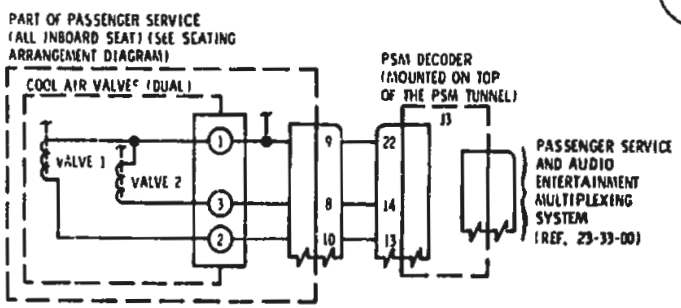
R
R
0018 EFFECTIVITY: ALL

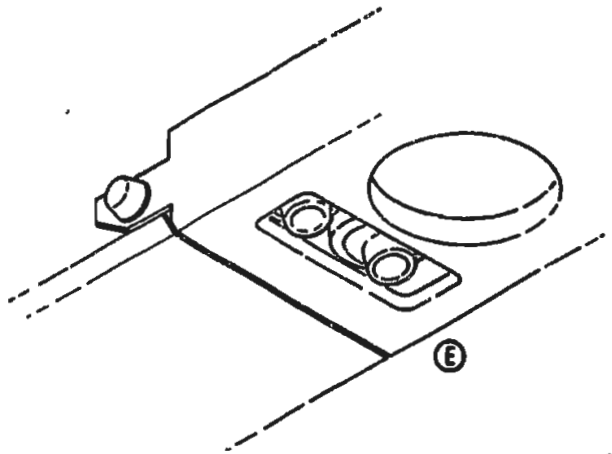




VALVE CROSS SECTION







G 883
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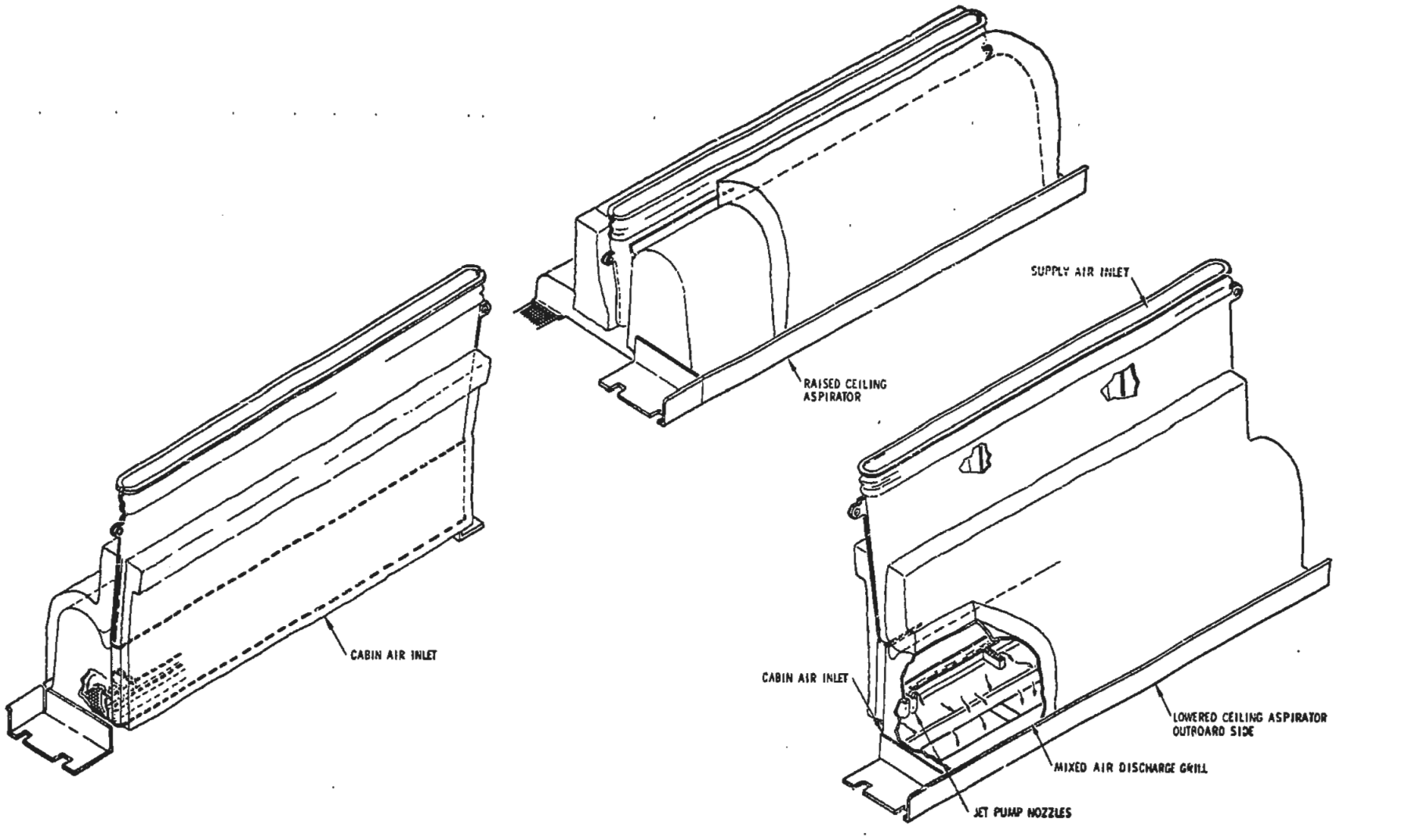
Individual Air Outlets
Figure 2 (Sheet 2)

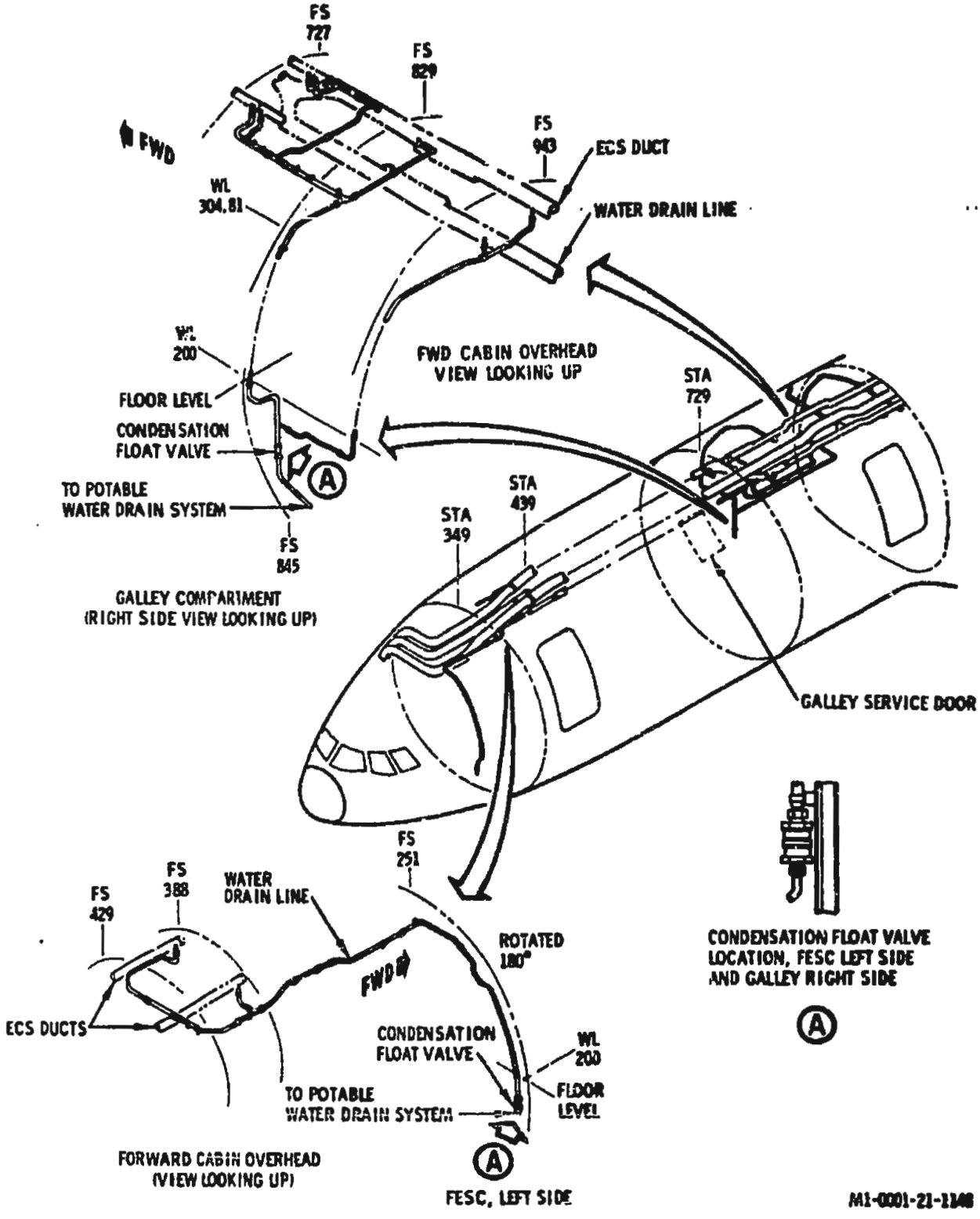


R
R

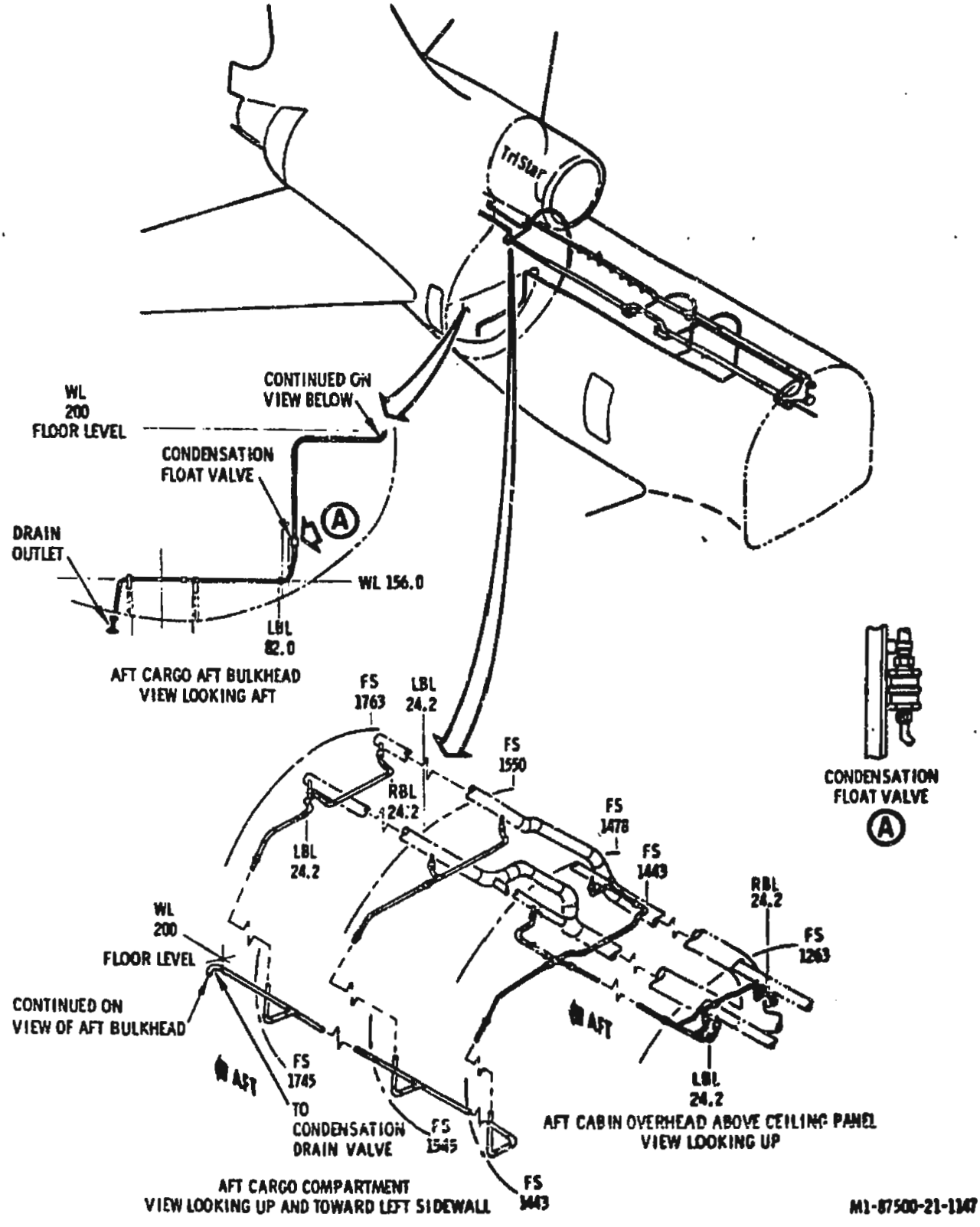
Cabin Aspirators
Figure 3

EFFECTIVITY: ALL

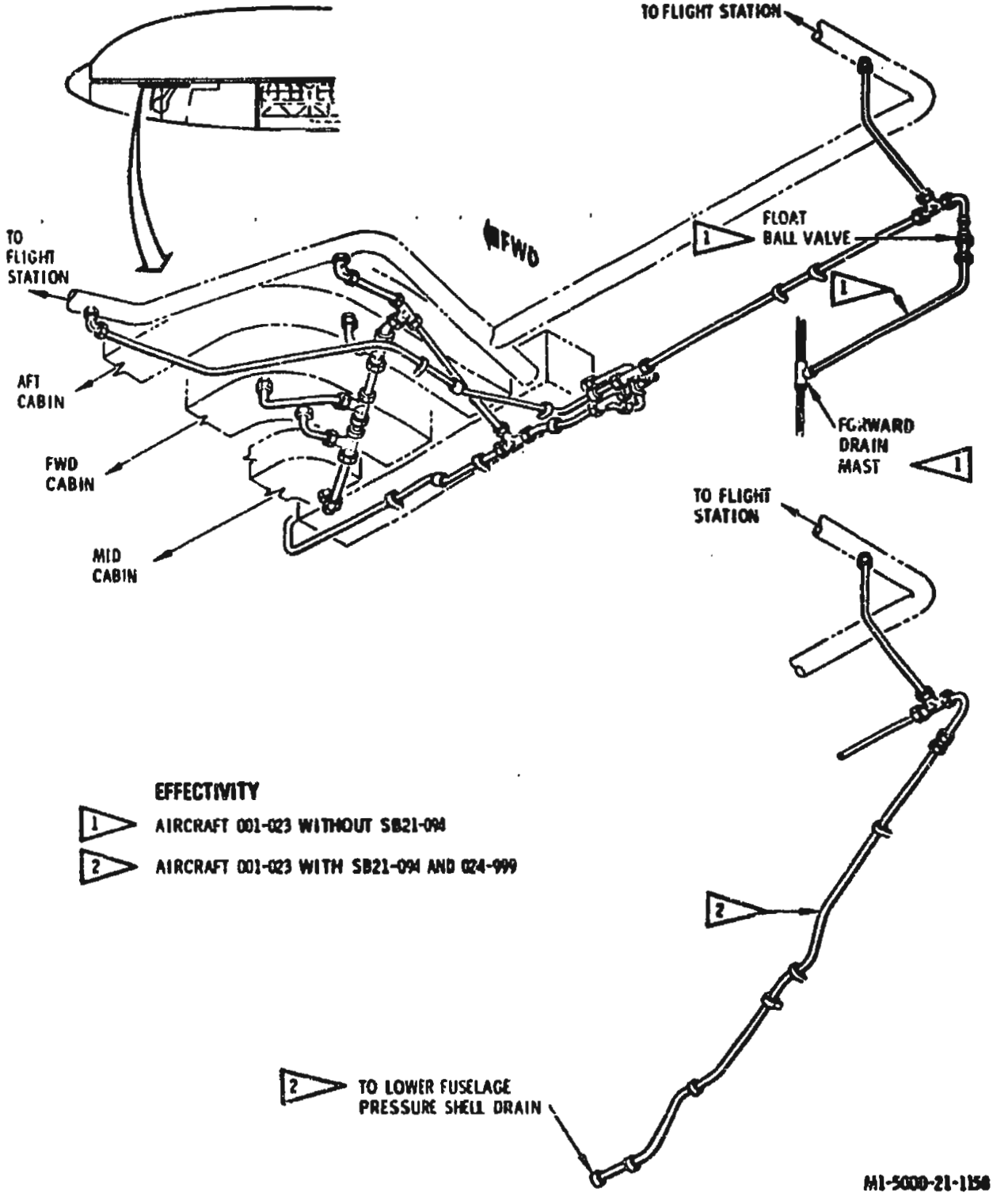
001B



R Forward-Mid Cabin ECS Drain System
R Figure 4



Mid-Aft Cabin ECS Drain System
Figure 5



R R Plenum and Lower ECS Drain System
Figure 6

R R EFFECTIVITY: ALL

001B

INDIVIDUAL AIR OUTLET - ADJUSTMENT AND TEST

1. Equipment and Materials

R Aiming and Shutoff Wand, Lockheed Aircraft Service P/N 4061029-5

2. Referenced Procedures

21-00-00	Air Conditioning System - Maintenance Practices
23-33-00	Passenger Audio Entertainment and Service System - Adjustment and Test
24-00-00	Electrical Power System - Maintenance Practices
R 25-27-00	Passenger Compartment Loose Equipment

3. Adjustment/Test

A. Adjustment

CAUTION: DO NOT EXERT EXCESSIVE PRESSURE IN ADJUSTMENT.

Adjustment of the individual air outlets consists of pointing the outlet to direct air flow onto the face of a seated passenger. Adjustment may be made with or without the air conditioning system in operation.

R The aiming and shutoff wand (Ref. 25-27-00) is used to aim air outlet position and to manually control the flow of air through individual air outlet (IAO). Wand tip has three adjustable positions. Shortest tip length is to be used for adjusting the direction of air. Intermediate tip length is for the operation of dual valves (IAO above seats inboard of aisle) and extended tip length (Ref. Fig. 501) is for the operation of single valves (IAO above seats outboard of aisle).

(1) Select correct tip length on wand, telescope (shorten) wand, and insert rod end into individual air outlet discharge opening.

(2) With hand near air outlet, to assure minimal force, move wand radially to point at upper part of seat back.

(3) Extend wand as needed, and position air outlet so wand points directly at head position of seated passenger (sit in seat if necessary).

(4) Remove wand from individual air outlet.

B. Operational Test

Test of the individual air outlets consists of verifying operation of valve solenoid to obtain full open, half open, and closed valve positions. Use correct tip length, (Ref. Fig. 501) for the operation of single or dual valves.

(1) Turn on electrical power (Ref. 24-00-00).

(2) Turn on air conditioning system (Ref. 21-00-00).

(3) Verify passenger audio entertainment and service system is in operation (Ref. 23-33-00).

(4) With hand near pertinent individual air outlet, to feel air flow changes, momentarily depress AIR switch on corresponding seat control panel.

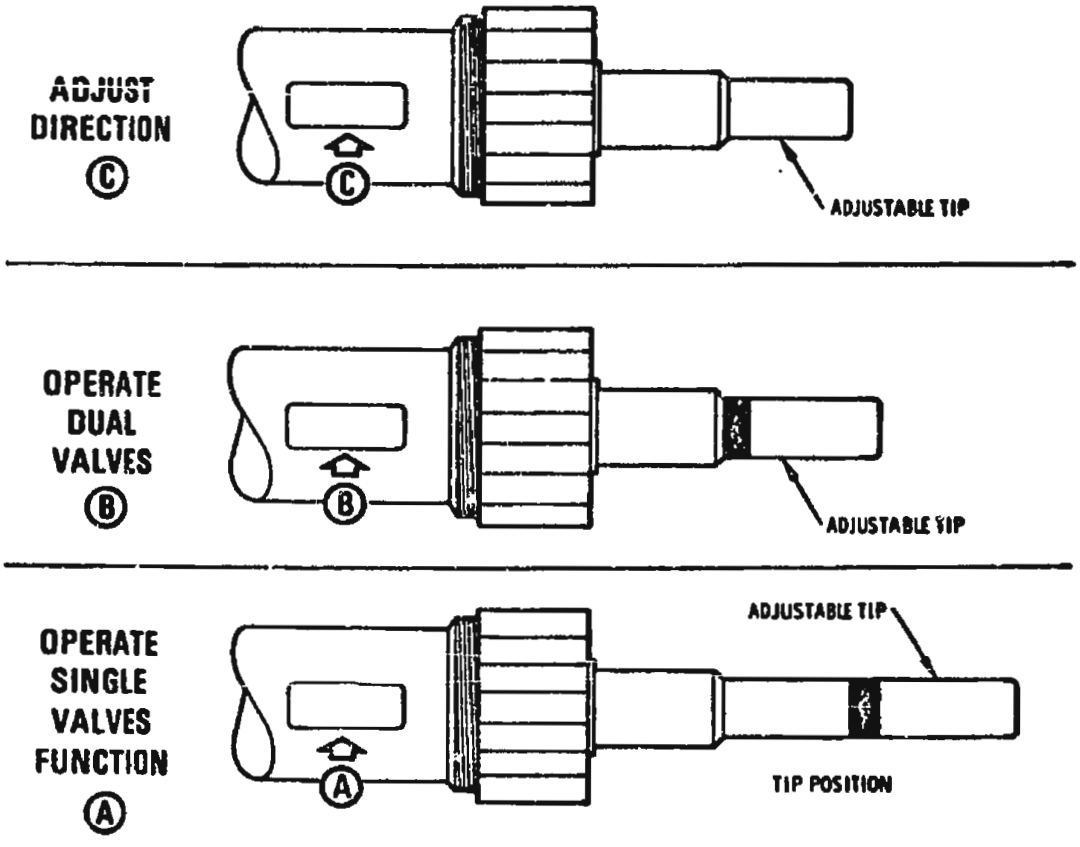
(5) Quantity of air flow from air outlet shall change each time AIR switch is depressed.

(6) Repeat Steps 3B(4) and 3B(5) as necessary to verify full open, half open and closed valve positions.

(7) Turn off air conditioning system (Ref. 21-00-00).

(8) Turn off electrical power (Ref. 24-00-00).

WARNING
DO NOT EXERT EXCESSIVE PRESSURE IN ADJUSTMENT



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R IAO Aiming and Shutoff Wand Tip Positions
R Figure 501

R EFFECTIVITY: ALL
R
001B

CABIN OVERHEAD ASPIRATORS - REMOVAL AND INSTALLATION

1. General

The cabin aspirators are long, rectangular jet pump assemblies with multiple jet nozzles (Ref. Fig. 401). The cabin aspirators, or jet pumps, are located directly below, and connect to openings in the cabin distribution ducts. The lower end of the aspirators fit into a trough formed by the outboard side of the passenger service module mounting channel and a rail at the inboard edge of the aisle ceiling panels. Fresh air from the distribution ducts discharges through multiple nozzles into the jet pump, which draws cabin air in through openings at the ceiling level near the aspirators. The aspirator discharge into the cabin area is a one-to-one mixture of fresh air and recirculated air. Using the aspirators increases cabin air circulation, prevents the air near the ceiling from becoming stale, and prevents discharge of visible moisture into the
R cabin.

If the aspirator housing is broken, fresh air from the distribution duct leaks into the over-ceiling area. Under certain conditions, the cold air from the ducts will condense moisture on the surrounding structure. This moisture then drips onto the ceiling panels and through the panels into the passenger compartment.

CR When there is a moisture problem in the cabin area, an
CR inspection should be made for broken aspirators. If broken or
CR cracked aspirator is found, install new aspirator.

R 2. Equipment and Materials

Aluminum Adhesive Tape, M3 No. 425 or equivalent; Arno Adhesive Tapes No. C-443

Isopropyl Alcohol Federal Specification TT-I-735 or equivalent

3. Referenced Procedure

21-00-00	Air Conditioning System - Description and Operation
25-26-01	Forward, Mid and Aft Ceiling Trim Drop Panels - Removal and Installation

4. Removal/Installation

A. Removal of Aspirators

(1) Tag Flight Engineer/Second Officers (FE/SO) engine bleed air and APU CONTROL panels and the two conditioned air connections to prevent system operation until completion of procedures.

(2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag following circuit breaker:

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5).

(3) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5),

PACK 2 - AUTO/MAN - DC (V7),

PACK 3 - AUTO-MAN - DC (V17).

NOTE: Removal is most easily accomplished from the outboard side.

(4) Loosen and hold spring loaded aspirator grills down until ceiling drop panels are fully lowered (Ref. 25-26-01).

NOTE: This action of holding spring loaded aspirator grills down will lessen the side loads to which grills are being subjected when ceiling drop panels contact the grills during the process of lowering.

NOTE: On aircraft 001-031, aspirator grille is fastened into place with latches (bullet catch).

NOTE: On aircraft 032-999, aspirator grille is fastened in place with velcro tape.

(5) Remove the upper insulation blankets on the long aspirators in the lowered ceiling areas, and save for reinstallation on the new aspirators. There is no upper blanket on the short aspirators.

NOTE: A 3/4-inch plywood panel approximately 2 feet wide and long enough to span at least three seat rows may be placed on the upright seat backs to form a convenient work platform. The underside of the board should be covered or padded to prevent snagging the seat back material.

(6) On the short aspirators, disconnect the aspirator from the recirculation air pan over the passenger service module trough by pulling out on the retainer pin knobs to release and remove the pins. There is one pin at each end of the aspirator. Release the aspirator grill attaching fasteners, reference Figure 402, and remove grill. This action also releases the bottom of aspirator.

(7) Remove the aluminum tape which seals the aspirator-to-duct joint.

(8) Disconnect the aspirator from the duct by pressing downward until the joint opens.

(9) Lower the aspirator through the guide trough.

CR B. Deleted

CR C. Deleted

CR D. Deleted

E. Installation of Aspirators

(1) Place the new aspirator in position up through the locating trough and align the top with the duct opening.

(2) Lift aspirator straight up, mating the top of the aspirator with the duct opening, until the bead on the aspirator snaps over the matching bead on the duct.

(3) Apply a layer of 1 1/2-inch wide aluminum adhesive tape, to seal the joint.

WARNING: USE ALCOHOL IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN. PROLONGED EXPOSURE MAY RESULT IN DIZZINESS OR RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP ALCOHOL AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL CONBUSTION.

NOTE: Clean all surfaces contacted by tape with Isopropyl Alcohol, to ensure that all hand oil, dirt, and moisture are removed.

(4) Reinstall upper insulation on the long aspirators.

(5) On the short aspirators, align the recirculation air pan and insert the retainer pins. Push the pin knobs in to lock the pins in position.

(6) Raise ceiling drop panels and close spring loaded aspirator grills (Ref. 25-26-01).

(7) Close all circuit breakers opened in Paragraph 4A.

(8) Remove WARNING tags installed in Step 4A(1).

5. Functional Test

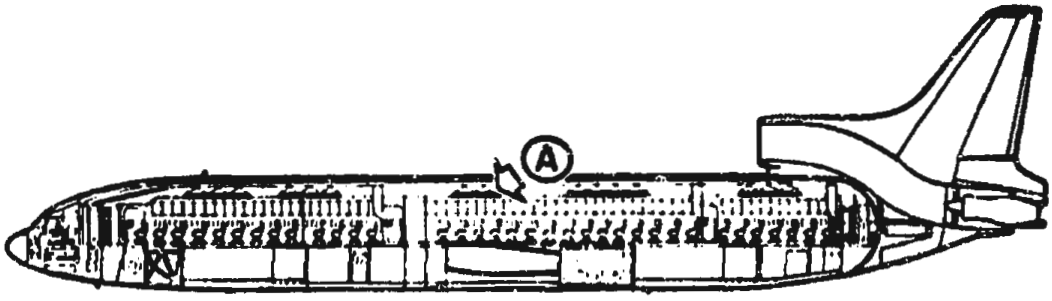
CR NOTE: Special check only when called out by MCIES. Not
CR required after replacing all aspirators.

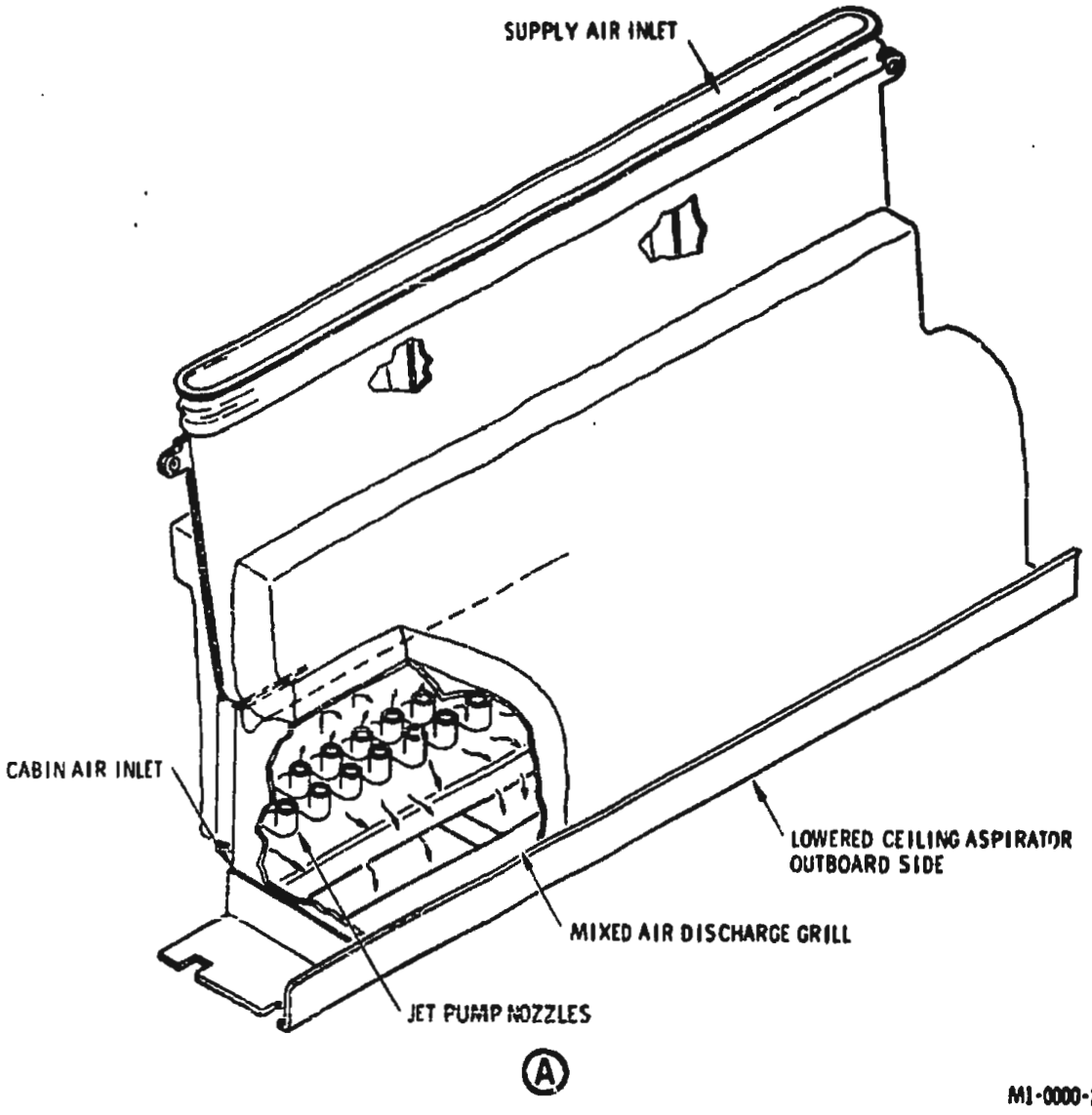
A. Operate the air conditioning system full cold (Ref. 21-00-00).

B. Lower ceiling drop panels in accordance with Step 4A(4) and check for air leak along sides of aspirator. There should be no leaking air along the sides of the aspirator.

NOTE: A 3/4-inch plywood panel approximately 2 feet wide and long enough to span at least three seat rows may be placed on the upright seat backs to form a convienent work platform. The underside of the board should be covered or padded to prevent snagging the seat back material.

C. Raise ceiling drop panels opened for access in Step 4A(4) and shut off the air conditioning system.





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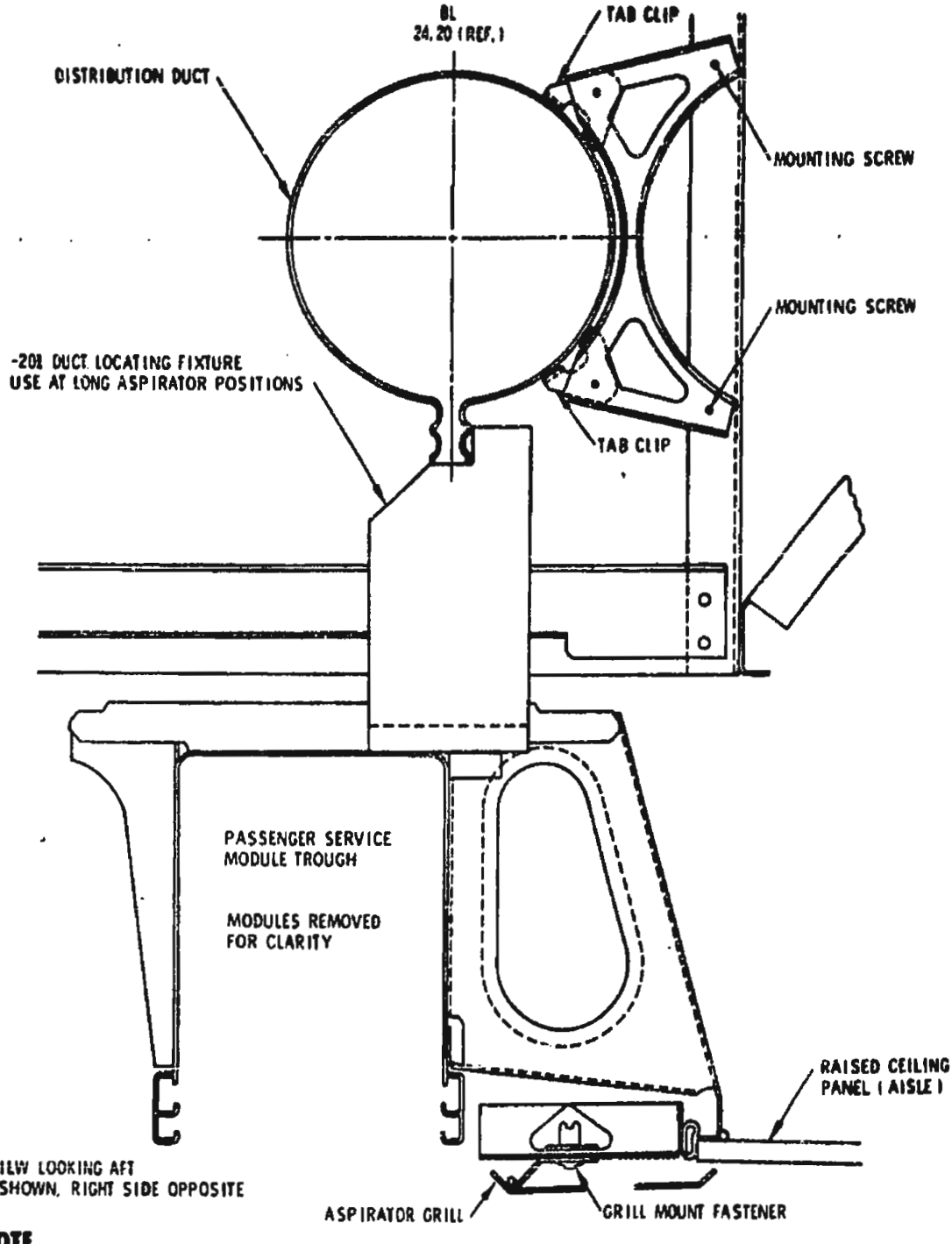
Cabin Aspirator/Jet Pump
Figure 401

R
R
001B EFFECTIVITY: ALL



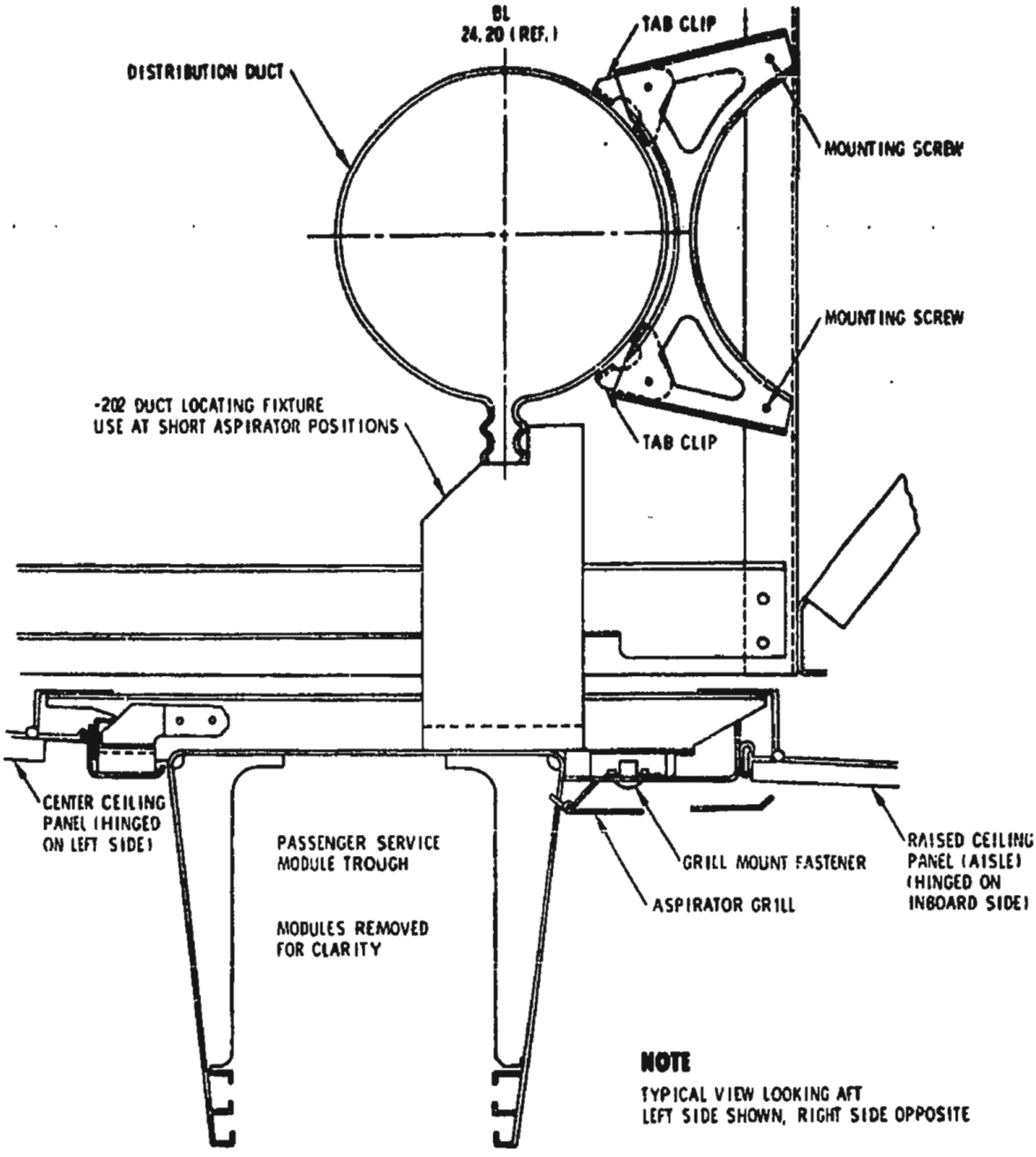
NOTE
TYPICAL VIEW LOOKING AFT
LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE

NOTE
FOR SPECIAL CHECKS CALLED OUT BY MCIES

M1-0000-21-2408

CR Air Distribution Duct Locating Fixture Use
CR Figure 402 (Sheet 1)

EFFECTIVITY: ALL



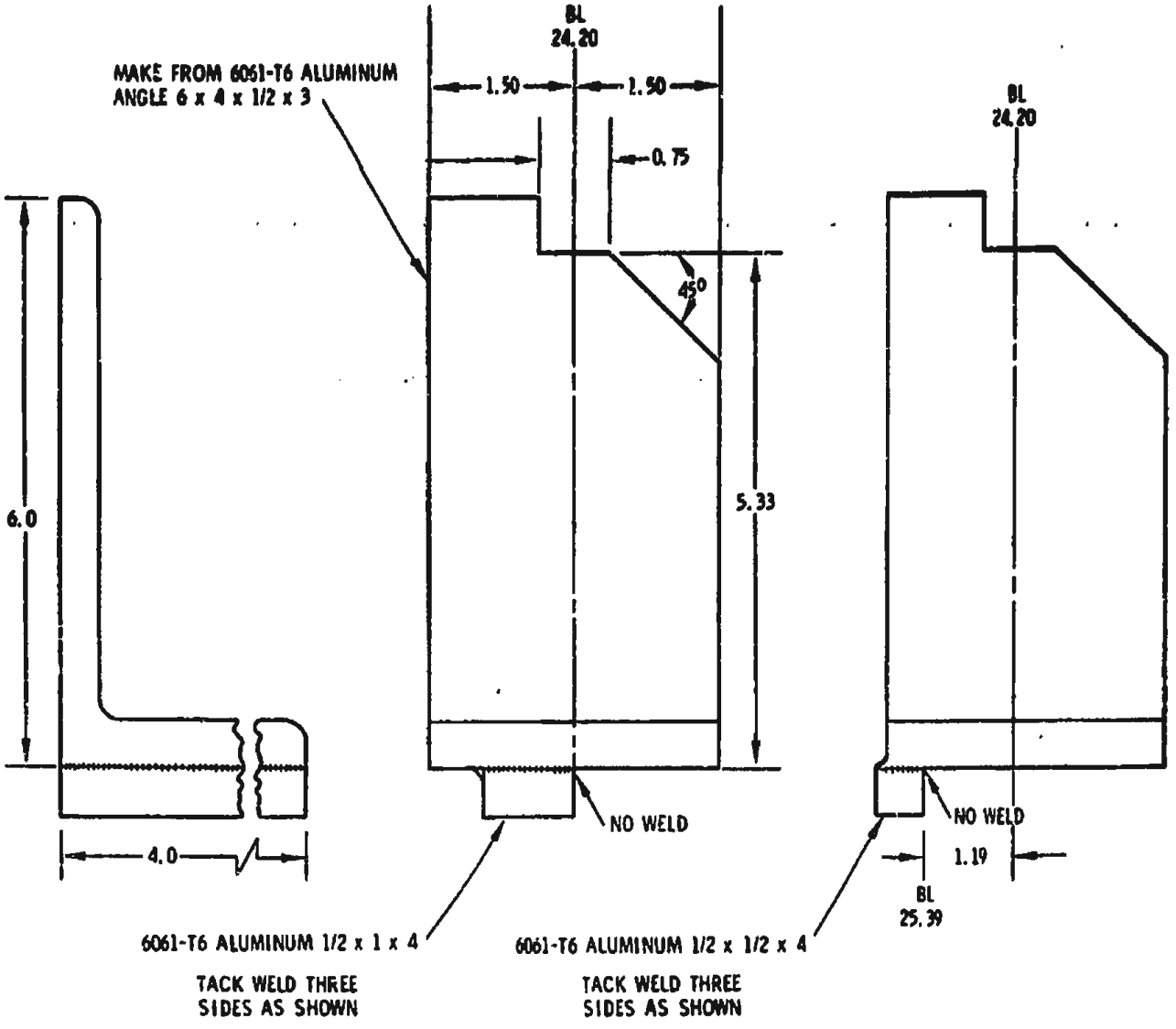
NOTE
FOR SPECIAL CHECKS CALLED OUT BY MCIES

M1-0000-21-2499

CR Air Distribution Duct Locating Fixture Use
CR Figure 402 (Sheet 2)

EFFECTIVITY: ALL

001B



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Air Distribution Duct Locating Fixture Dimensions
Figure 403

CABIN OVERHEAD ASPIRATOR - CLEANING/PAINTING

1. General

The cabin aspirators are long, rectangular jet pump assemblies with multiple jet nozzles.

Fresh air from the distribution ducts discharges through multiple nozzles into the jet pump, which draws cabin air in through openings at the ceiling level near the aspirators. The aspirator discharge into the cabin area is a one-to-one mixture of fresh air and recirculated air.

As the air is recirculated through the aspirator, all dust/lint particles will accumulate on the flow divider assembly and around the nozzles.

2. Referenced Procedure

21-00-00	Air conditioning - Maintenance Practices
24-00-00	Electrical Power - Maintenance Practices
25-26-01	Forward, Mid and Aft Ceiling Trim Drop Panels - Removal and Installation

3. Equipment and Materials

Vacuum cleaner with hose and brush, cleaning solution, Brulin 815MX, cleaning rags.

4. Cleaning/Painting

A. Gain Access

(1) Insure all 3 pack flow control valves are selected to off.

(2) Drop outboard luminaires.

NOTE: Luminaires are latched on the outboard edge.

R (3) Open outboard grilles along center overhead passenger service module.

R NOTE: Grilles are hinged on inboard edge and attached with clips on outboard edge.

(4) Remove flow divider assembly by pulling captive fastener button at each end out approximately 1/8 inch. Reference Figure 701.

CAUTION: PULL DIVIDER STRAIGHT DOWN, INSURE JET PUMP ASSEMBLY IS NOT REMOVED WITH FLOW DIVIDER. ALL DIVIDERS ARE NOT THE SAME LENGTH. TAKE NOTE OF WHICH POSITION DIVIDER COMES OUT FOR RE-INSTALLATION IN THE SAME PLACE.

WARNING: USE BRULIN SOLUTION IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN, OR EYE IRRITATION.

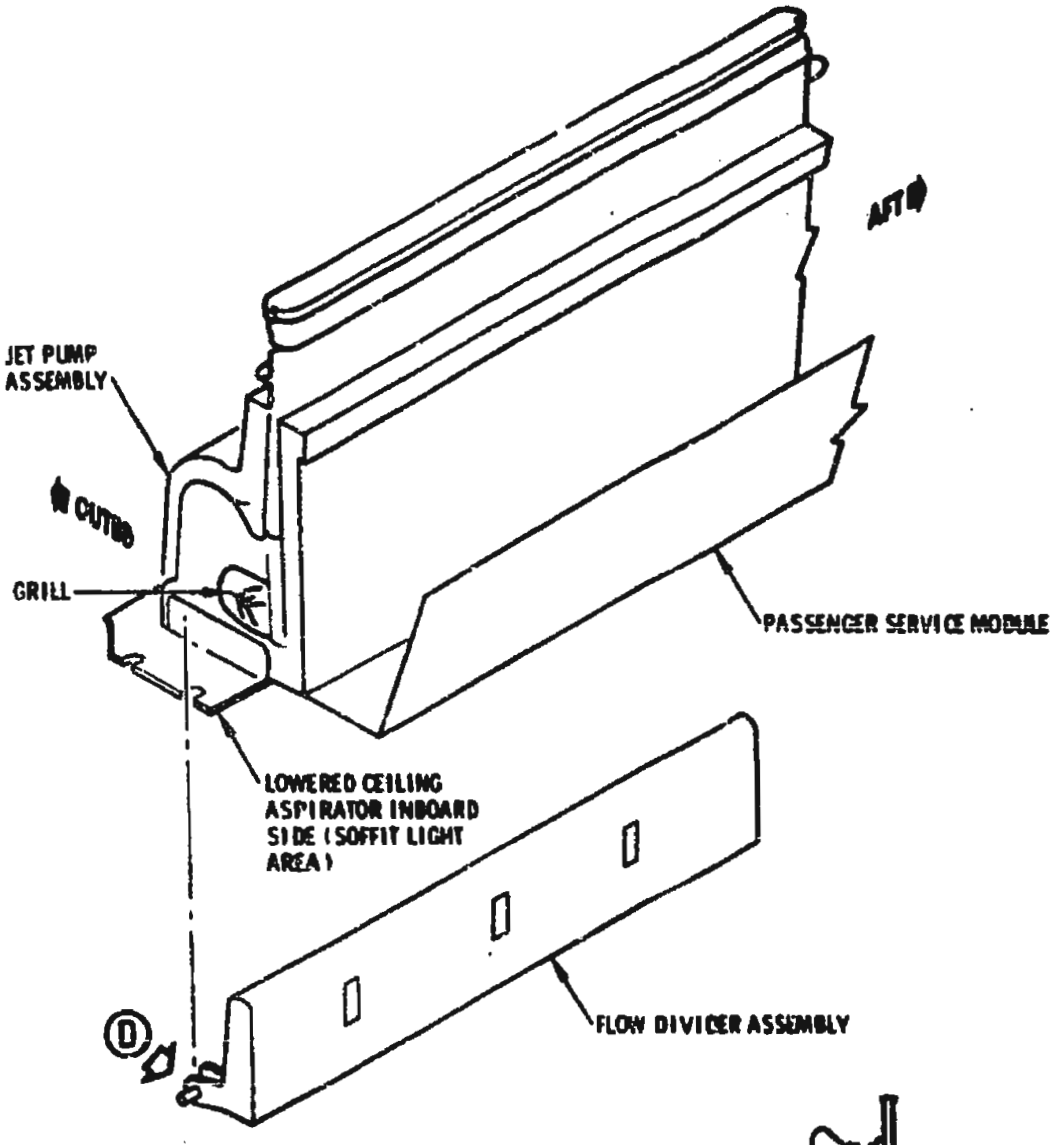
(5) Vacuum lint/dust off divider and inside of aspirator. Wipe down divider and inside of aspirator with Brulin solution.

NOTE: Dilute solution as required for job accomplishment. Do not immerse foamed divider in any liquids.

(6) Reinstall flow divider and secure captive fastener buttons.

R (7) Close grilles opened in Step 3A(3).

(8) Return aircraft to normal.



TYPICAL REMOVAL AND INSTALLATION OF FLOW DIVIDER ASSEMBLY FROM JET PUMP ASSEMBLY IN LOW RIGHT SIDE CEILING AREAS (SOFFIT LIGHTS) SHOW REMOVAL AND INSTALLATION IN RAISED RIGHT SIDE (LUMINAIRE) AND ALL LEFT SIDE CEILING AREAS SIMILAR

(D) TYPICAL FOR BUTTON FASTENER AT EACH END OF FLOW DIVIDER ASSEMBLY

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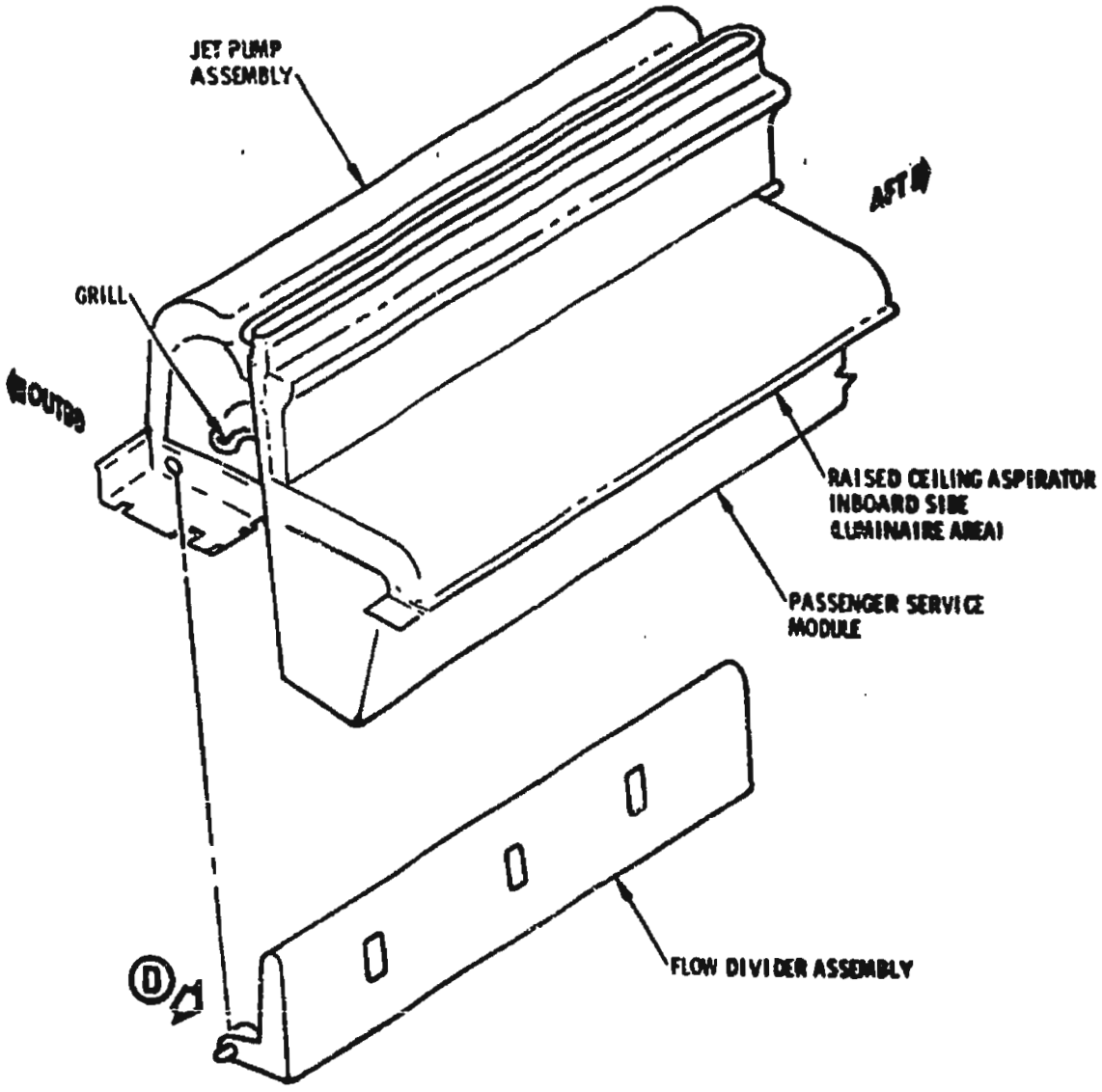
R
R

Cabin Overhead Aspirator
Figure 701 (Sheet 1)

EFFECTIVITY: ALL

0018



TYPICAL REMOVAL AND INSTALLATION OF FLOW DIVIDER ASSEMBLY FROM JET PUMP ASSEMBLY IN HIGH CEILING AREAS (ABOVE LUMINAIRES)

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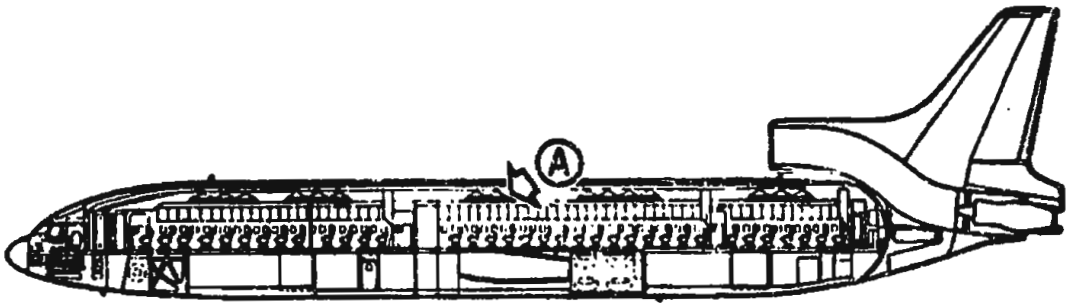
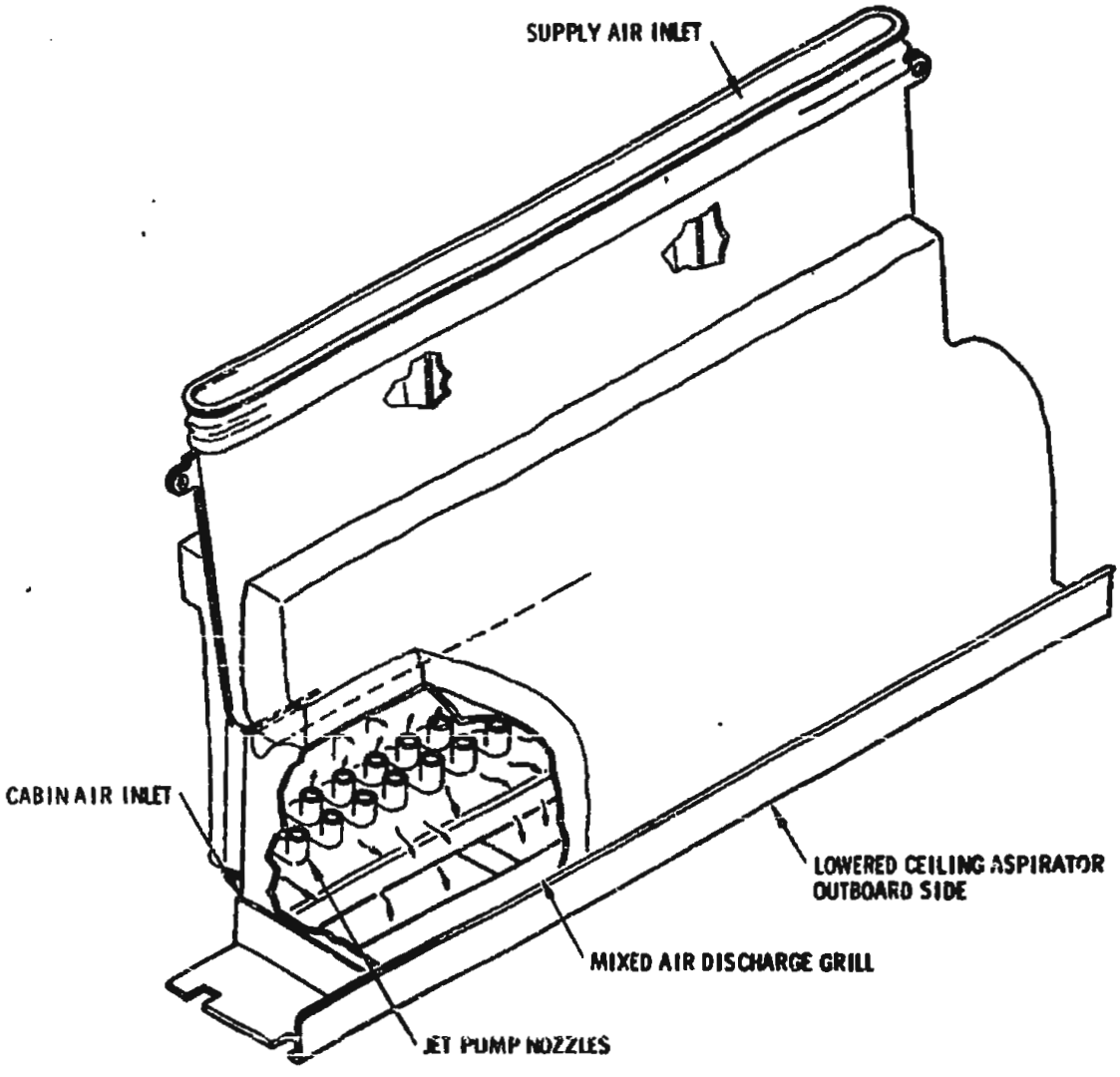
R
R

Cabin Overhead Aspirator
Figure 701 (Sheet 2)

EFFECTIVITY: ALL

001B





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R Cabin Overhead Aspirator
R Figure 701 (Sheet 3)

R EFFECTIVITY: ALL
R
001B

CABIN OVERHEAD ASPIRATORS - APPROVED REPAIRS

1. General

Cabin overhead aspirators (jet pumps) are subject to cracking if not aligned properly with distribution duct opening during installation. The repairs described are common for short and long aspirators.

2. Equipment and Materials

Plastic sheet stock, thermoplastic, 0.060 inch thick or equivalent General Electric Co., SL 1002 NO. 1 Plastics Ave., Pittsfield, Mass., 01201 or Cadillac Plastics and Chemical Co., Chicago, Ill

Glass Fabric Cloth, plain weave, 13 oz/yd. Thalco Galss Fiber Products, Style No. 1534, Volan A or Erskin Johns Mills, Los Angeles, Calif.

R Glass Fabric Cloth, 0.10 inch thick, (MIL-C-9094C, Type 181), or
R equivalent

Methyl-Ethyl-Ketone (MEK) (Fed. Spec; TT-M-261), or equivalent

R Aliphatic Naphtha (Fed. Spec; TT-N-95), or equivalent

URALANE 5738 A/B (P-3 primer), or equivalent, Furan Plastic, Glendale, Calif.

R Flexobond 207-A Polyurethane Adhesive, Bacon Industries Inc. of
R California, 16731 Hale Ave., Irvine, Calif.

R Flexobond BA-400 Activator, Bacon Industries Inc. of California,
R 16731 Hale Ave., Irvine, Calif.

R Sand Paper, Ultrafine, 3M Company or equivalent

BUNA-N or Equivalent, Minnesota Mining, EC 2126 (MIL-A-5092, Type III)

Woodform Block - Make from any local source easily worked wood. Form to fit contour of damaged surfaces on aspirators.

3. Referenced Procedure

	21-00-00	Air Conditioning - Maintenance Practices
R	21-23-05	Cabin Overhead Aspirator - Removal and Installation
	24-00-00	Electrical Power - Maintenance Practices
	25-26-01	Forward, Mid and Aft Ceiling Trim Panels - Removal and Installation

4. Approved Repair

A. Preparation

(1) On Flight Engineer/Second Officers (FE/SO) ENGINE BLEED CONTROL panel, release all three PACK FLOW CONTROL switchlights and verify flowbars are off if pneumatic system is operating.

NOTE: Remove conditioned ground air if connected.

(2) Drop outboard luminaires.

NOTE: Luminaires are latched on the outboard edge.

(3) Loosen and hold spring loaded aspirator grilles down until ceiling drop panels are fully lowered (Ref. 25-26-01).

NOTE: This action of holding spring loaded aspirator grilles down will lessen the side loads to which grilles are being subjected when ceiling drop panels contact the grilles during the process of lowering.

(4) For broken aspirators approved repairs, perform procedure in accordance with Step 4B.

(5) For cracked aspirators approved repairs, perform procedure in accordance with Step 4C.

B. Broken Aspirators

WARNING: USE MEK IN WELL-VENTILATED AREA. AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION. KEEP MEK AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(1) Remove insulation batt by pulling slowly with a steady pressure to avoid tearing the material. Use MEK to loosen material if necessary. Retain insulation for reuse.

(2) Clean up or cut away broken and jagged edges of damaged (Ref. Fig. 801) panels using a fine toothed rotary saw or a hand held saw blade. Radius all corners to avoid stress notches.

R R (3) Using ultrafine sand paper, sand the cut edges smooth removing all sharp surfaces. Sand all contact surfaces.

WARNING: USE NAPTHA IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP NAPTHA AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(4) Using aliphatic naptha on a clean cloth, clean area around trimmed edges for at least one (1) inch from the edge.

NOTE: Do not permit cleaner to air dry.

(5) Wipe cleaner dry with clean cloths.

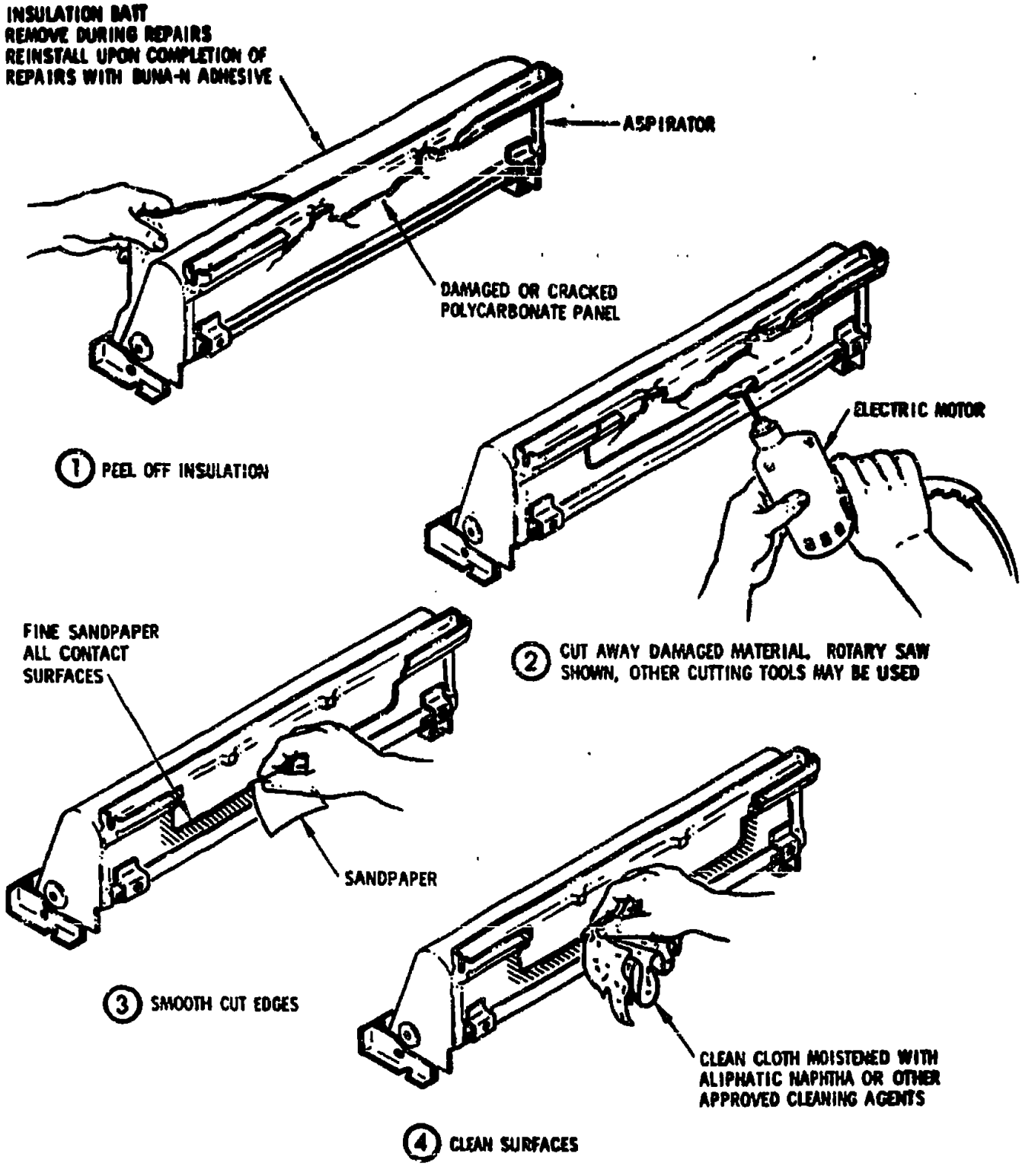
(6) Use a contoured wooden block to fit into the aspirator partitions to act as a back-up for the plastic sheet or glass cloth repair material.

(7) Wrap exposed surface of wooden block with wax paper or similar protection to avoid sticking to adhesives, and slide or fit the form block into the aspirator.

(8) Cut insert repair from preformed sheet. Cut doubler large enough to permit an overlap of at least one inch from edge of the existing panel material and repair insert.

NOTE: Be certain the panel material is clean.

WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP ADHESIVE AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.



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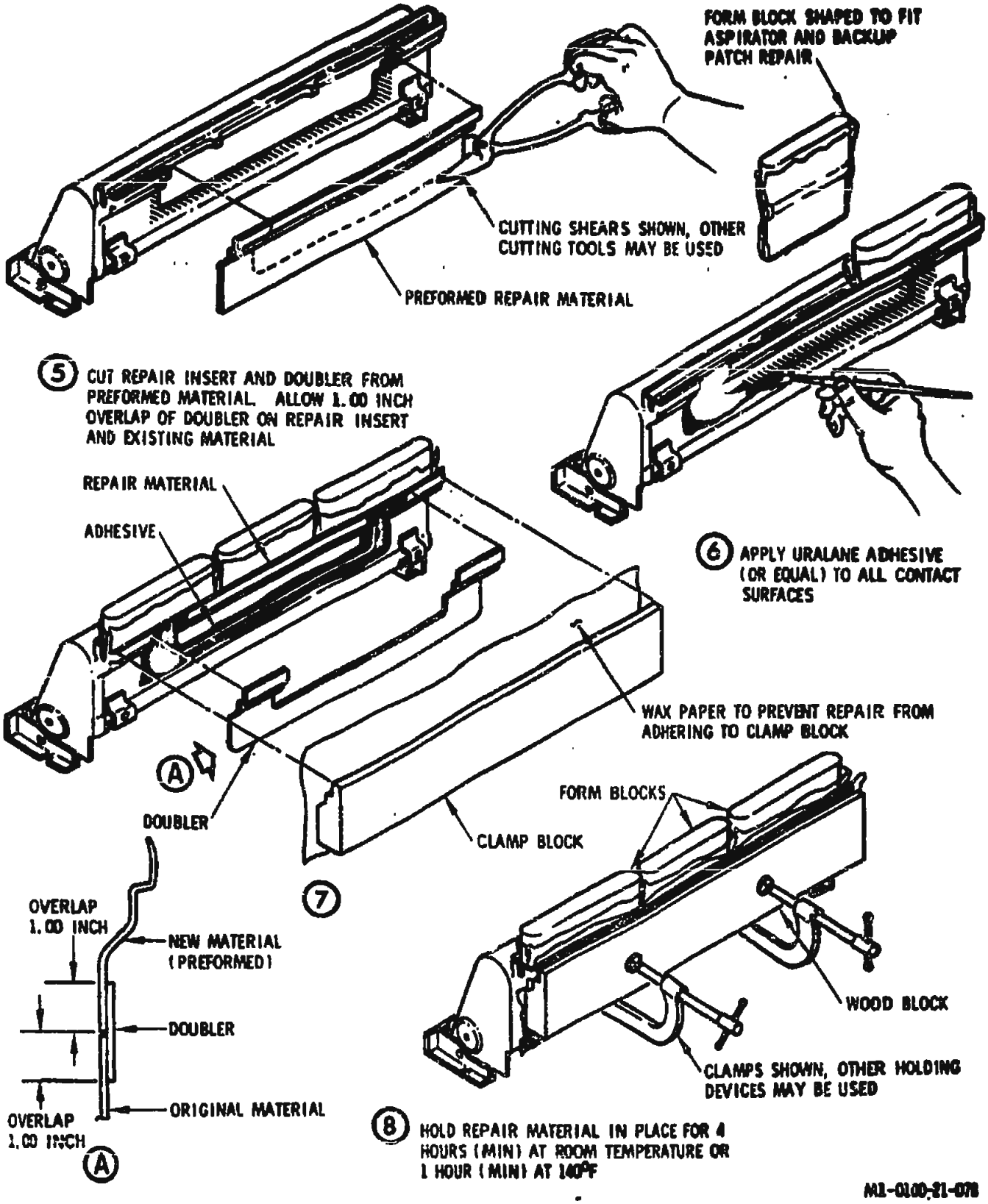
Aspirator Damage Repair
Figure 801 (Sheet 1)


FORM BLOCK SHAPED TO FIT ASPIRATOR AND BACKUP PATCH REPAIR
CUTTING SHEARS SHOWN, OTHER CUTTING TOOLS MAY BE USED
PREFORMED REPAIR MATERIAL
5 CUT REPAIR INSERT AND DOUBLER FROM PREFORMED MATERIAL. ALLOW 1.00 INCH OVERLAP OF DOUBLER ON REPAIR INSERT AND EXISTING MATERIAL
REPAIR MATERIAL
ADHESIVE
6 APPLY URALANE ADHESIVE (OR EQUAL) TO ALL CONTACT SURFACES
WAX PAPER TO PREVENT REPAIR FROM ADHERING TO CLAMP BLOCK
A
DOUBLER
CLAMP BLOCK
7
FORM BLOCKS
OVERLAP 1.00 INCH
NEW MATERIAL (PREFORMED)
DOUBLER
ORIGINAL MATERIAL
OVERLAP 1.00 INCH
A
WOOD BLOCK
CLAMPS SHOWN, OTHER HOLDING DEVICES MAY BE USED
8 HOLD REPAIR MATERIAL IN PLACE FOR 4 HOURS (MIN) AT ROOM TEMPERATURE OR 1 HOUR (MIN) AT 140°F
M1-0100-21-078

Aspirator Damage Repair
Figure 801 (Sheet 2)

(9) Apply a uniform coating of Uralane (or equivalent) adhesive 0.005 to 0.015 inch thick on all surfaces to be mated.

(10) Apply doubler to panel surfaces. Press and roll adhesive coated surfaces to create a continuous bead of adhesive around edges of joint.

(11) Remove excess adhesive with a cloth dampened with MEK.

(12) Hold doubler in place securely for four (4) hours minimum at room temperature or one (1) hour at 140°F.

(13) Remove the wood form block.

WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP ADHESIVE AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(14) Replace the insulation batt using BUNA-N rubber base adhesive MIL-A-5092 type III. Adhesive should be applied to the outer edges of the batt in a continuous line. This will provide a seal to ensure that no cold surfaces are exposed to condensation.

(15) Raise ceiling drop panels opened for access in Step 4A(3).

(16) Return aircraft to normal.

C. Cracked Aspirators

(1) Prepare aircraft in accordance with procedure in Step 4A.

WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM SKIN, OR EYE IRRITATION. KEEP ADHESIVE AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(2) For small cracks a glass fabric repair may be used. Apply three plies of cloth and catalyzed Uralane 5738 A/B resin (or equivalent) to the area of repair using standard layup techniques. Extend the first ply at least one inch beyond the cleaned up edges and the next

succeeding two plies at least one half inch beyond panel cleaned up edges. Cure for four (4) hours at room temperature or for one (1) hour at 140°F.

(3) Raise ceiling drop panels opened for access in Step 4A(3).

(4) Return aircraft to normal.

R D. Reinforcement of Aspirators to Prevent Cracking

R (1) Remove cabin aspirators (Ref. 21-23-05).

R NOTE: All aspirators are not the same length. Take
R note of position of each aspirator for
R reinstallation in the same place.

R (2) Apply glass cloth reinforcement to raised and lowered
R ceiling aspirators as follows (Ref. Fig. 802).

R WARNING: USE CLEANING SOLVENTS IN WELL-VENTILATED
R AREA. DO NOT INHALE VAPOR AND AVOID CONTACT
R WITH SKIN AND EYES. PROLONGED EXPOSURE MAY
R RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE
R IRRITATION. KEEP CLEANING SOLVENTS AWAY FROM
R HEAT, SPARKS, AND OPEN FLAME. FAILURE TO
R COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (a) Remove insulation batts by pulling slowly with a
R steady pressure to avoid tearing the material.
R Use MEK to loosen material if necessary. Retain
R insulation for reuse.

R (b) Using ultrafine sand paper, sand aspirator surfaces to which glass cloth reinforcement is to be applied.

WARNING: USE CLEANING SOLVENTS IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP CLEANING SOLVENTS AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

CAUTION: DO NOT PERMIT CLEANER TO AIR DRY. IF GLASS CLOTH REINFORCEMENT IS NOT APPLIED WITHIN FOUR HOURS, RECLEAN BEFORE APPLYING GLASS CLOTH REINFORCEMENT.

(c) Using aliphatic naphtha on a clean cloth, clean sand papered area and wipe cleaner dry with clean cloths.

WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP ADHESIVE AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

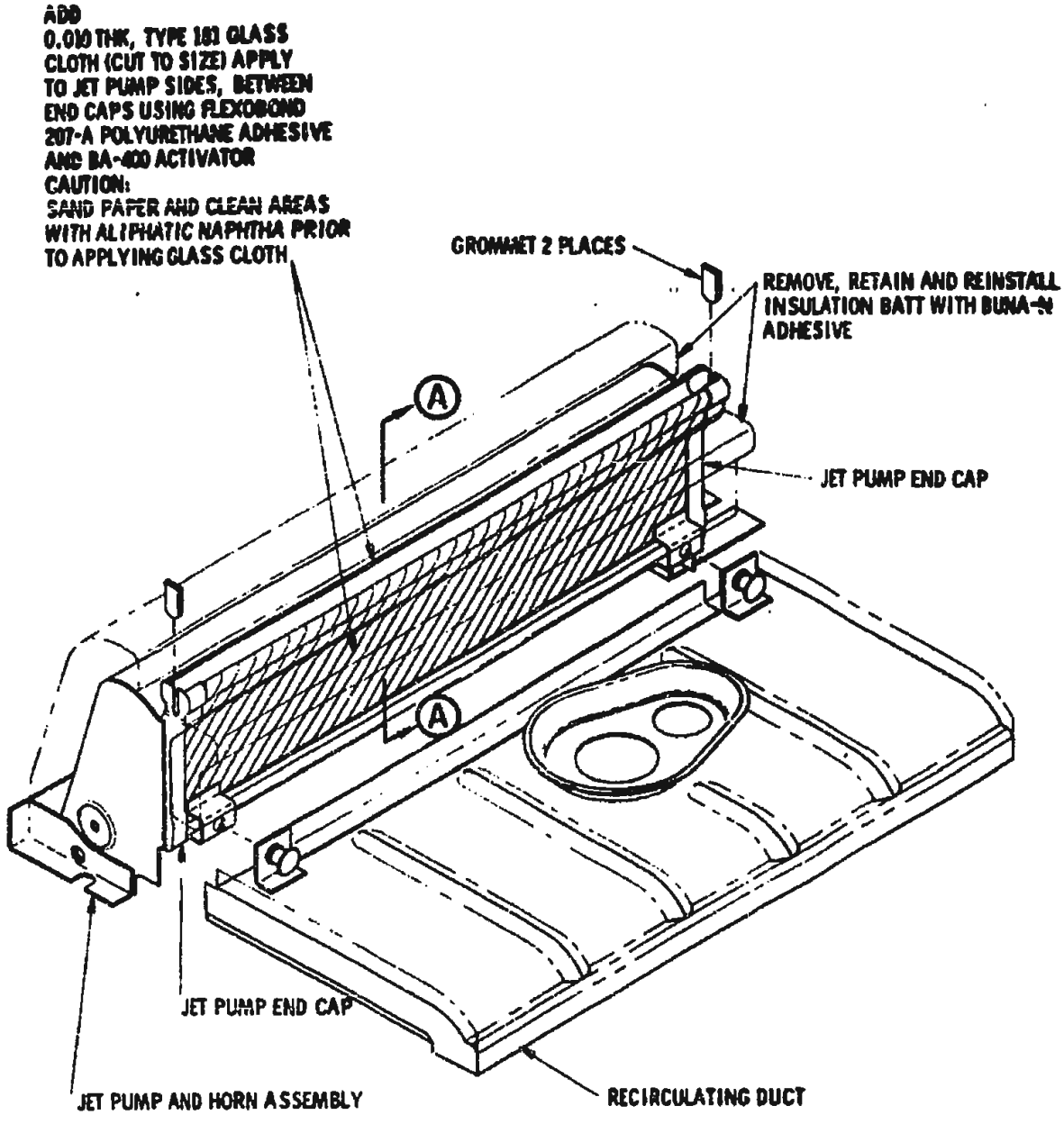
(d) Apply one ply of 181 glass cloth (cut to size) using Flexobond 207-A polyurethane adhesive, with BA-400 activator to the areas sand papered in Step 4D(2)(b) using standard layup techniques. Allow to air cure approximately 30 minutes.

NOTE: If an aspirator has a small crack in area to be reinforced, take note of crack location and add two additional plies of 181 glass cloth over crack. Extend first succeeding ply approximately one inch each side and ends of crack and second succeeding ply one half inch each side and ends of crack.

WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION. KEEP ADHESIVE AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(e) Replace insulation batts using BUNA-N rubber base adhesive MIL-A-5092 type III. Adhesive should be applied to the outer edges of the batt in a continuous line. This will provide a seal to ensure that no cold surfaces are exposed to condensation.

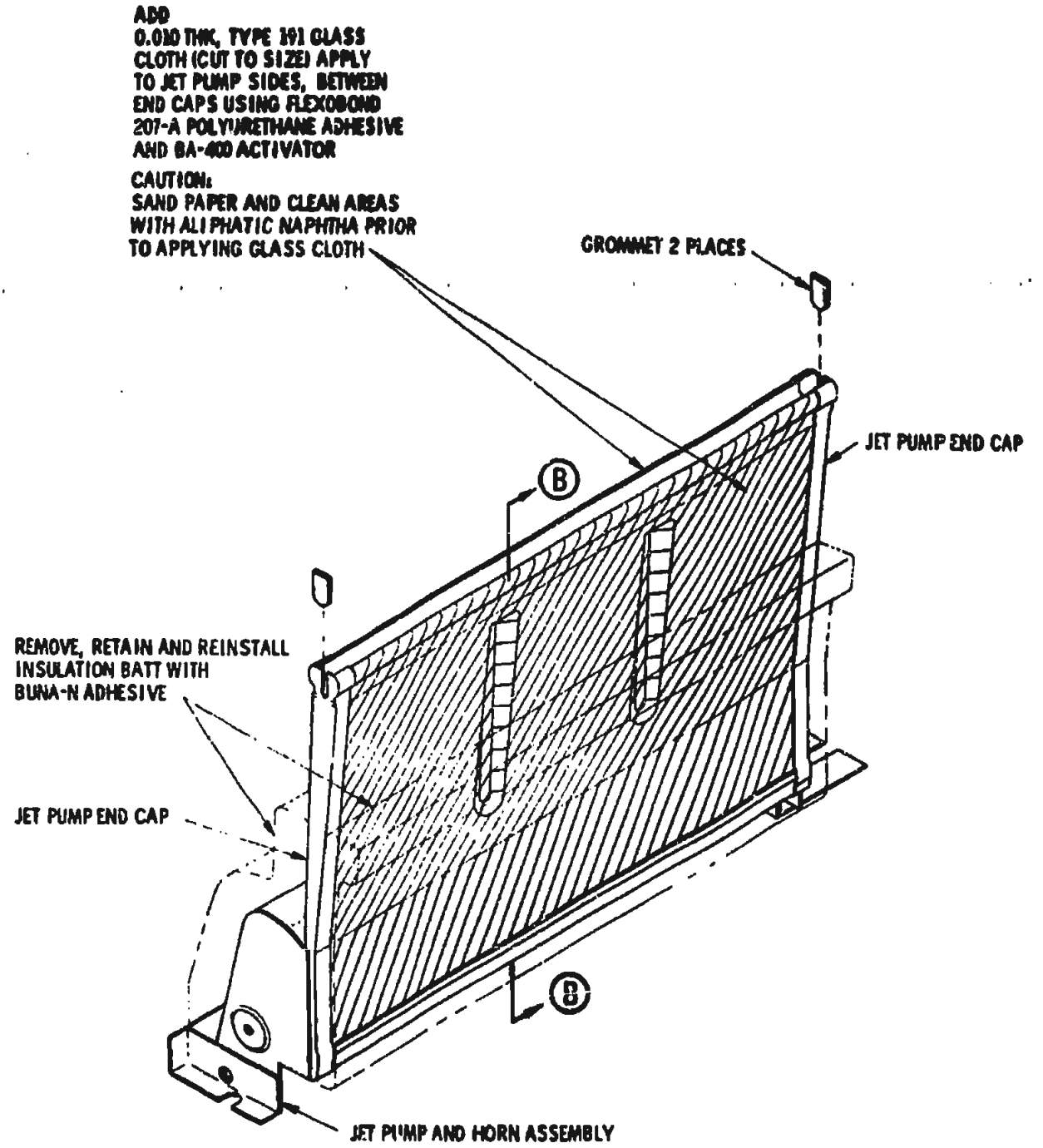
(3) Reinstall reworked cabin aspirators (Ref. 21-23-05).


ADD
0.010 THK, TYPE 181 GLASS CLOTH (CUT TO SIZE) APPLY TO JET PUMP SIDES, BETWEEN END CAPS USING FLEXOBOND 207-A POLYURETHANE ADHESIVE AND BA-400 ACTIVATOR
CAUTION:
SAND PAPER AND CLEAN AREAS WITH ALIPHATIC NAPHTHA PRIOR TO APPLYING GLASS CLOTH
GROMMET 2 PLACES
REMOVE, RETAIN AND REINSTALL INSULATION BATT WITH BUNA-N ADHESIVE
A
A
JET PUMP END CAP
JET PUMP END CAP
JET PUMP AND HORN ASSEMBLY
RECIRCULATING DUCT

TYPICAL RAISED CEILING ASPIRATOR

M1-0000-21-2204

R
R Aspirator Jet Pump Reinforcement
Figure 802 (Sheet 1)

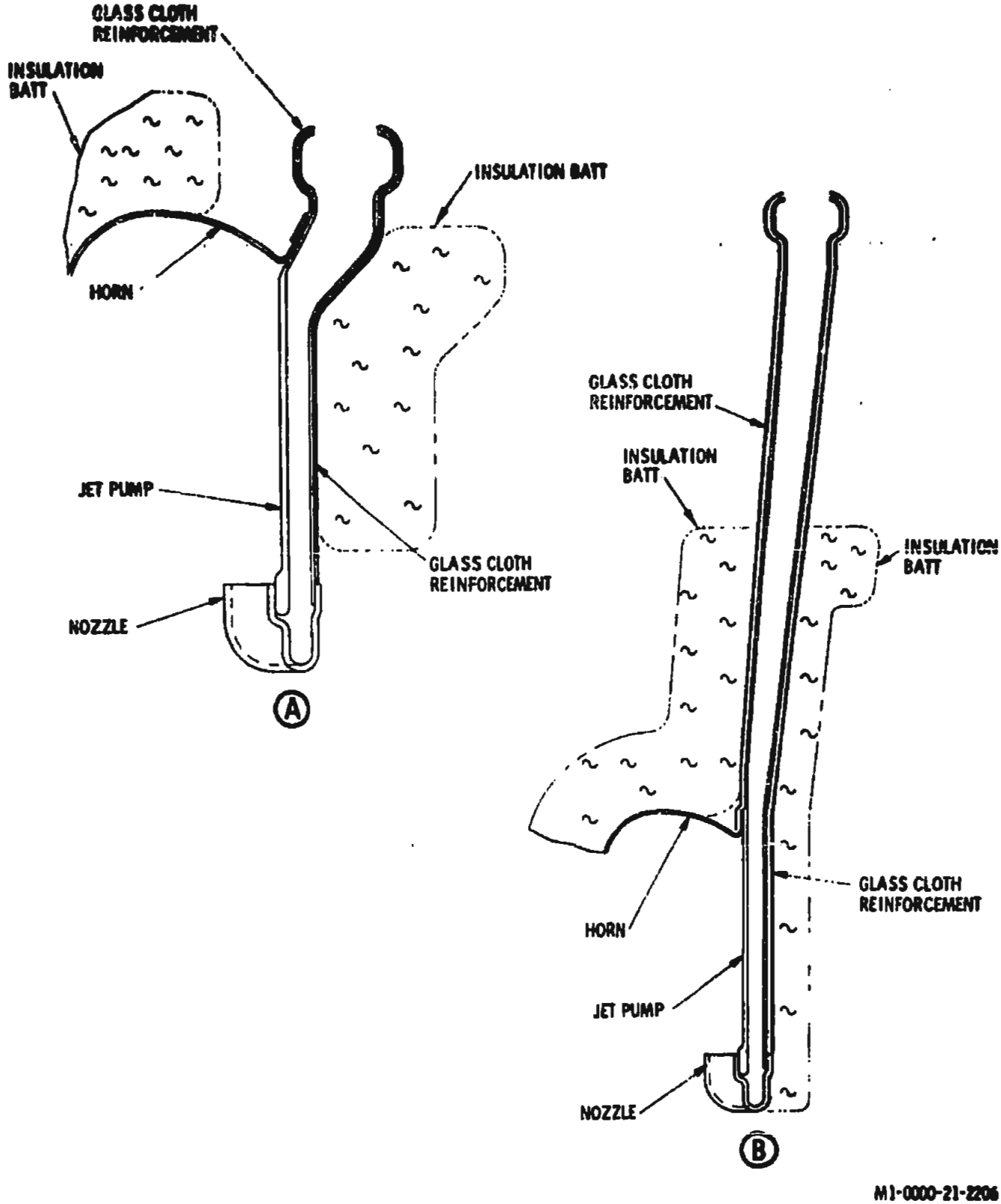


TYPICAL LOWERED CEILING ASPIRATOR

M1-0000-21-2205

R Aspirator Jet Pump Reinforcement
R Figure 802 (Sheet 2)

R EFFECTIVITY: ALL
R
001B



R Aspirator Jet Pump Reinforcement
R Figure 802 (Sheet 3)

R EFFECTIVITY: ALL
R
0018

CR # CABIN RETURN AIR GRILLE - CLEANING AND PAINTING

CR 1. General

CR The cabin return air grilles are located at floor level left and right outboard sides of the cabin. Circulated conditioned air exits the cabin through these grilles, down along the cargo sidewalls and out through the outflow valves.

CR NOTE: There are two types of return grilles. One type is a grill attached to the sidewalls by 2 screws on each side of the grille. The other type is the decompression air grille, 47 each per aircraft, located throughout the cabin. The visual difference is that the decompression grille is slightly smaller in area and has a frame around the grille holes. The grille hole plate is held on by 4 screws and the frame is held on to the sidewalls by 2 screws.

CR 2. Referenced Procedure

CR None

CR 3. Equipment and Materials

CR Vacuum cleaner with hose and brush/crevice tool

CR Cleaning solution - Brulin 815MX

CR Cleaning rags.

CR 4. Cleaning/Painting

CR A. Non-Decompression Air Grilles

CR (1) Remove grille from sidewall by removing 2 attaching screws.

CR (2) Vacuum both sides of grille and cavity inside sidewall.

CR (3) Wipe down grille with cleaning solution to remove any nicotine/tar accumulation.

CR (4) Reinstall grille.

CR B. Decompression Air Grilles

CR (1) Remove grille plate by removing 4 each 10-32 screws.
CR DO NOT REMOVE 2 EACH SCREWS ON OUTBOARD EDGE OF FRAME.

CR (2) Vacuum both sides of grille and cavity inside grille
CR plenum.

CR (3) Wipe down grille with cleaning solution to remove any
CR nicotine/tar accumulation.

CR (4) Reinstall grill

CR NOTE: If grille opens, it can be reset closed by
CR pulling it from the lower center of grill.

CR (5) Return aircraft to normal.

CONDENSATE DRAIN VALVE - REMOVAL AND INSTALLATION

1. General

Three condensate drain valves are used in the drain system. The forward cabin valve is located in the forward electronic service center (FESC) on the left side at FS251, zone 113. The forward-mid cabin valve is located outboard of the right side of the forward cargo compartment at FS845, zone 132. The mid-aft cabin valve is located aft of the aft cargo compartment at FS1810, zone 167.

2. Equipment and Materials

Catch basin

Protective caps

3. Referenced Procedures

21-00-00	Air Conditioning - Maintenance Practices
25-51-06	Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

(1) Shut off all three air conditioning packs (Ref. 21-00-00). Placard Flight Engineer/Second Officers (FE/SO) IPS panel and two preconditioned air connections to prevent system operation until completion of procedures.

(2) Remove cargo compartment liners (Ref. 25-51-06) as follows:

R Mid-aft valve: Right side at FS845

Aft valve: Aft bulkhead

NOTE: Forward valve is in FESC, zone 113, left side.

(3) Locate valve and remove lower tube, (Ref. Figure 401).

(4) Place basin below valve, to catch draining water, and remove upper tube.

(5) Remove screws and nuts and remove valve. Save all hardware for installation.

(6) On forward valve remove union. Save for installation.

(7) Install protective caps on valve and tubes.

B. Installation

R (1) Verify air conditioning is off (Ref. 21-00-00).

(2) For forward valve install union removed in Step 4A(6).

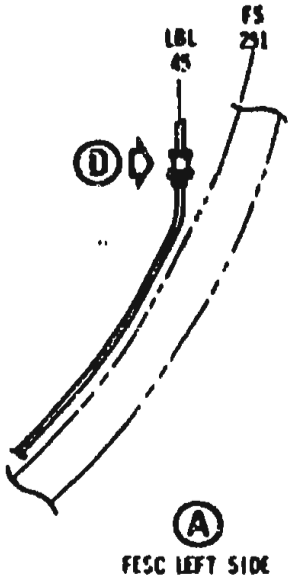
(3) Install valve in place, with arrow pointing up, using hardware removed in Step 4A(5).

(4) Install upper and lower tubes.

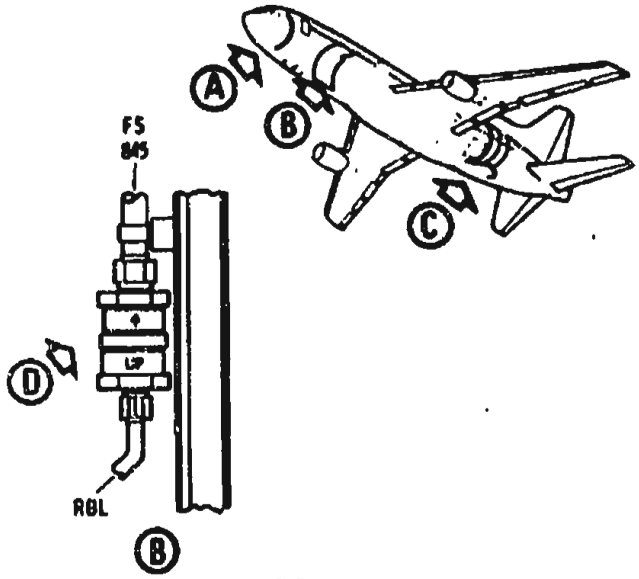
(5) Replace cargo compartment liner panels removed in Step 4A(2).

(6) Remove placards installed in Step 4A(1).

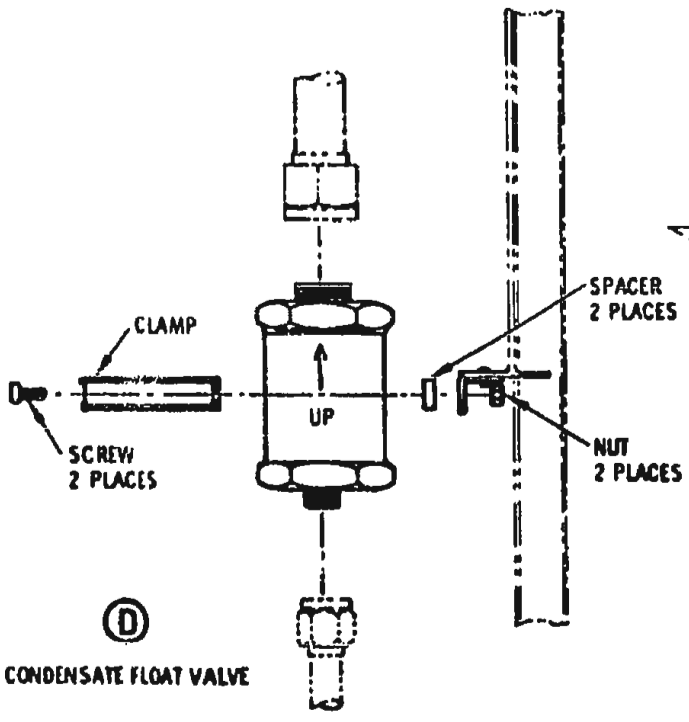
R (7) Turn on air conditioning if required (Ref. 21-00-00).



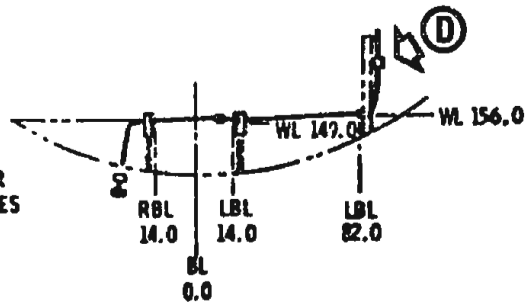
A
FESC LEFT SIDE



B
FORWARD CARGO COMPARTMENT



D
CONDENSATE FLOAT VALVE



C
VIEW LOOKING AFT FROM FS 1780

M1-0100-21-1113

R ECS Condensation Drain Float Valve - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

C CABIN OVERHEAD AIR DISTRIBUTION DUCT NOZZLE - APPROVED REPAIRS

C 1. General

C A. The plastic portion of the nozzle assembly that retains the airflow restrictor becomes broken and separated, releasing the airflow restrictor. The following repair restores this portion of the nozzle assembly.

C 2. Equipment and Materials

C Cleaner - Nonflammable, interior

C 3. Approved Repair of Nozzle Assembly (Ref. Figure 801)

C A. Remove the extended portion of the airflow restrictor flush to nozzle assembly on both sides.

C B. Clean the portion of the nozzle being reworked to provide for sealant adhesion.

C C. Using new repair flanges, P/N A03972-1, trim to the required length to fit inside the nozzle assembly.

C D. Locate the repair flanges and install using pull rivets; rivet spacing to be 3 to 4 inches.

C E. Install new airflow restrictor P/N A03973-1.

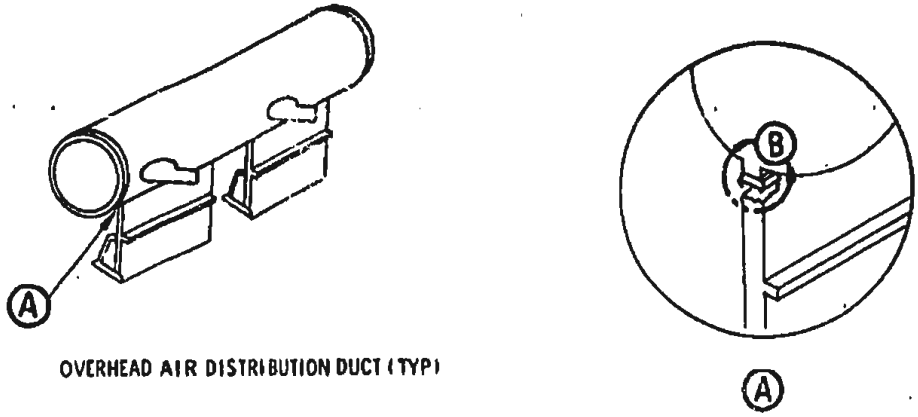
CR 4. Approved Extensive Repair of Nozzle Assembly (Ref. Figure 801A)

CR A. Clean the exisisting portion of the nozzle being reworked to provide for good sealant adhesion.

CR B. Using new repair flanges, P/N AD3972-2, trim to the required length to fit inside the remaining portion of the nozzle.

CR C. Locate the repair flanges and install with adhesive P/N Devcon 14300 or equivilent and clamp into place keeping within the dimensions in Figure 801A.

CR D. Install new airflow restrictor P/N A03973-1



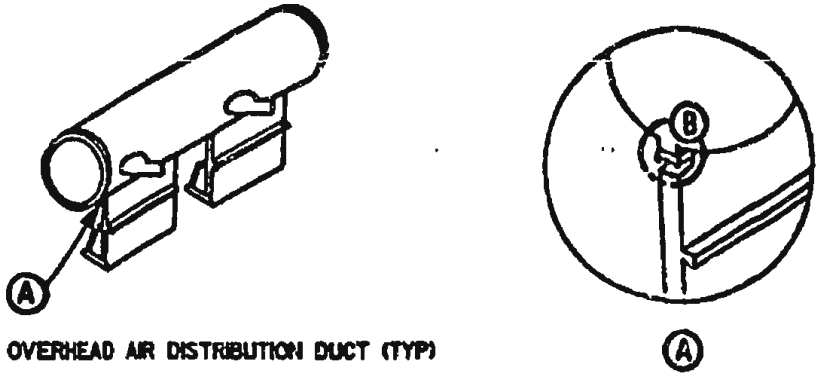
M1-0001-21-2488

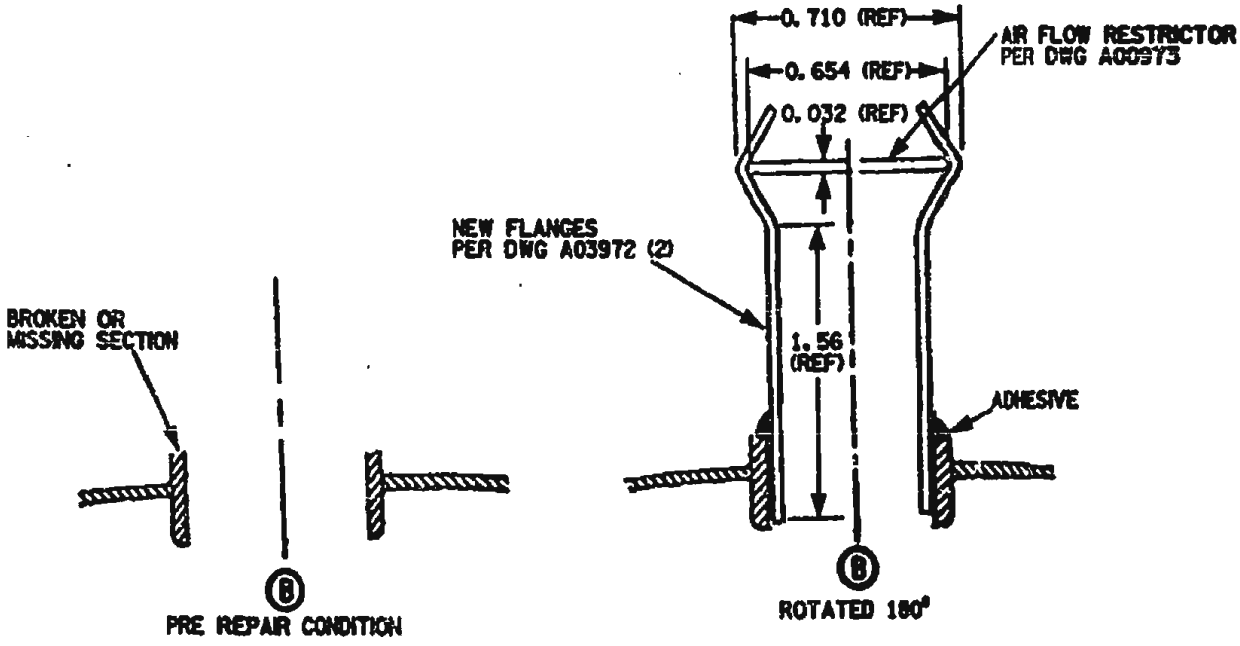
CR
CR

Nozzle Repair
Figure 801

EFFECTIVITY: ALL

001B





MI-0000-21-2542

CR
CR

Nozzle Repair
Figure 801A

R EFFECTIVITY: ALL
R
001B

GALLEY SYSTEM - DESCRIPTION AND OPERATION

1. General

The galley system includes both the incoming supply air distribution system and the positive ventilation/exhaust air system.

A. Supply

Supply air for the galley is taken from the cold air plenum (Ref. 21-51-00) and the hot air manifold (Ref. 21-41-00), and temperature-controlled by the zone trim control system (Ref. 21-61-00). The quantity of airflow to the galley is controlled by the galley supply airflow control valve to a maximum of 425 cubic feet per minute. A portion of this air (half-inch-diameter line) is used by the potable water air supply system compressor (Ref. 38-41-00) to pressurize the main water supply tank.

From the cold air plenum and hot air manifold, located in the forward electronic service center, zone 113, the galley supply air duct crosses to the left side of the fuselage. At this point, the duct goes aft above the left heat exchanger and environmental control system compartments, zones 115 and 117, into the left cheek area outboard of the forward cargo compartment, zone 123, to the supply airflow control valve (Ref. Fig. 1).

From the valve, the duct continues aft to the area outboard of the galley, zone 133, where it branches into four ducts to the galley overhead area, zone 135. The four ducts cross to the right to large outlet plenum assemblies that surround each of the four light fixtures in the galley ceiling. NORMAL, WARM UP, and SLOW selective positions of a control lever, at the plenum inlet, direct discharge airflow through or around a jet pump assembly (Ref. Fig. 1). Individual air outlets in the ceiling on each side of the galley lift are supplied from the aft-most cross-ceiling duct.

B. Exhaust

The galley exhaust system provides positive scavenging of heat and odors from the galley. The air is discharged directly overboard at a nearly constant rate of flow, both
R in flight and on the ground. Major system components are
R the galley exhaust fan, the exhaust airflow control valve,
R and the duct in-flow relief valve in the left cheek area
R outboard of the forward cargo compartment (Ref. Fig. 2).

R NOTE: On aircraft 033-999,
R the galley duct in-flow relief valve has been
R deleted.

Galley exhaust air is drawn from above each of the six ovens. The air is exhausted into a duct outboard of the left side of the galley. The duct then goes forward to the exhaust fan outboard of the left aft corner of the forward cargo compartment, zone 123.

The galley exhaust fan is a 115/200V ac, 400 Hz, three-phase motor with an axial vane in-line impeller. Motor protection is provided by a built-in thermal overload self-resetting switch in the motor case. The fan runs continuously as long as power is on AC Bus No. 2.

From the fan, galley air is exhausted directly overboard through the galley exhaust airflow control valve. Exhaust airflow through this valve is maintained at an almost constant quantity by a valve disc pivoted on an off-center shaft. The disc is spring-loaded toward the open position and, as air moves through the valve, pressure on the unbalanced areas of the disc attempts to close the valve against the spring. Increased valve inlet pressure moves the disc further towards the closed position, with a resultant constant airflow. An electrical actuator on the valve provides positive closure when it is necessary to conserve cabin pressure because of reduced air supply.

R On aircraft 001-032,
R the galley exhaust duct in-flow relief valve is on the T-duct between the fan and the exhaust valve. The galley exhaust duct in-flow relief valve is on the T-duct between the fan and the exhaust valve. The in-flow relief valve will open to prevent collapse of galley exhaust ducting in event of duct blockage upstream of the fan or if exhaust flow control valve malfunction results in excessive overboard flow.

The refrigerator cooling fan exhaust air is ducted from behind each refrigerator to the galley underfloor area, zone 136. From there the air moves forward to be exhausted overboard through the forward outflow valve.

Gaseous carbon dioxide, from dry ice refrigerated service carts, is vented overboard through the carbon dioxide vent subsystem (Ref. Fig. 3). This subsystem consists of two screened openings in the left side of the galley floor, one below the galley sink and one opposite and just forward of the galley door, and ducting connecting the openings to the MESC exhaust system (Ref. 21-25-00). When the MESC system

is operating, or when the aircraft is pressurized, air and gas at floor level is drawn overboard by that system.

CR Ducting for oven vent system for the forward service center CR runs down through the service center and floor outboard to CR the left side of the fuselage and aft to the forward cargo CR compartment. At the forward end of the cargo compartment, CR the duct routes down to the left sidewall then aft to the CR galley exhaust duct. A two inch duct connects to the CR galley exhaust duct about 8 inches up-stream of the exhaust CR fan. A removable section of the ducting is provided CR between stations 649 and 669 to permit access to and removal CR of the galley exhaust valve. Downstream of the removable CR section is a flame arrestor to provide isolation between the CR lower galley ducting and the forward service center ducting.

2. Operation

The galley exhaust air system operates continuously, both in flight and on the ground, to remove heat and odors from the galley. Air taken from around the ovens by the exhaust fan is normally exhausted directly overboard through the exhaust airflow control valve. In the event of reduced cabin air supply, such as operation on only one air cycle pack (Ref. 21-21-00), the overboard exhaust valve may be closed to conserve cabin pressure. When this valve is closed, galley exhaust air flow ceases. If a duct blockage occurs upstream of the fan, or exhaust flow control valve malfunction allows excessive flow through the system, the duct in-flow relief valve opens to protect galley exhaust ducting from collapse until the exhaust valve can be closed.

NOTE: On aircraft 033-999, the galley duct in-flow relief valve has been deleted.

The electrical actuator on the galley exhaust airflow control valve (Ref. Fig. 4) provides positive closure control of the valve through an override circuit common with the exhaust flow control valves for the forward electronic and mid electrical service center compartments (Ref. 21-25-00).

All three valves close when the COOL AIR OVBD switchlight on the Flight Engineer/Second Officers ECS MONITOR panel is released. Releasing the switchlight energizes the close windings on the valves, and the CLOSE legend on the switchlight comes on.

The galley exhaust airflow control valve is opened by releasing the switchlight (out). The actuator includes limit switches at both the close and open positions (Ref. Fig. 3).

3. Supply Air Flow Control Valve

A. Description

The galley supply airflow control valve is a 6-inch-diameter, unbalanced, disc-type flow control valve. The disc is unbalanced in that the shaft upon which it rotates attaches to the disc at an off-center position, giving unequal valve plate areas on the two sides of the shaft. The disc and shaft assembly are spring-loaded to the valve-open position. The valve is test-bench calibrated, and spring force is adjusted to provide a controlled airflow of 425 cubic feet per minute (cfm) with an inlet air pressure between 6 and 15 inches of water.

The valve is used to control flow of conditioned air to the galley distribution system. The valve is installed in the galley supply air duct outboard of the forward cargo compartment, zone 123. This valve and the flight station supply air flow control valve (Ref. 21-22-00) are identical.

B. Operation

Conditioned air flowing through the supply airflow control valve to the galley is a mixture of cold air plenum and zone trim system air that has been temperature-controlled by the zone trim control system (Ref. 21-61-00). Air pressure at the valve inlet is the same as the cold air plenum pressure, which is limited to 13 to 15 inches of water by the plenum relief valve.

As the supply air flows through the flow control valve, air pressure acting on the unequal areas of the unbalanced disc moves the disc toward the closed postion. The movement of the disc toward the closed position is opposed by the bench-adjusted disc shaft which is spring-loaded toward the open position. The amount of closure is proportional to the valve inlet air pressure.

4. Exhaust Air Flow Control Valve

A. Description

The galley exhaust airflow control valve limits galley exhaust airflow to a nearly constant quantity at all normal cabin differential pressures. Flow calibration is made at 8.44 pounds per square inch differential (psid) cabin pressure. With a sea level cabin altitude, at a flight altitude of 23,000 feet, the valve will control flow to between 38 and 44 pounds per minute. With an 8,000 foot cabin altitude, at a flight altitude of 42,000 feet, flow

will be between 29 and 37.5 pounds per minute. On the ground, without cabin pressurization, the valve will pass the full flow of the galley exhaust air fan, 535 cubic feet per minute.

The galley exhaust airflow control valve is installed in the lower left fuselage wall near the aft end of the forward cargo compartment, zone 123.

An electrical actuator on the valve provides positive valve closure to conserve cabin pressure in event of appreciable reduction of cabin air supply by a malfunction in that system (Ref. 21-21-00). The actuator includes open and close limit position switches to deenergize the motor windings at each positon (Ref. Fig. 5).

When the electrical actuator is in the open position, the valve is in the normal flow-control position. The valve disc is mounted on a shaft that is off-center to provide more valve disc area on one side of the shaft than on the other. The shaft is spring-loaded to hold the disc almost full open, with the larger area of the disc upstream. When the actuator moves to the closed position, the spring force is overcome to provide positive closure.

B. Operation

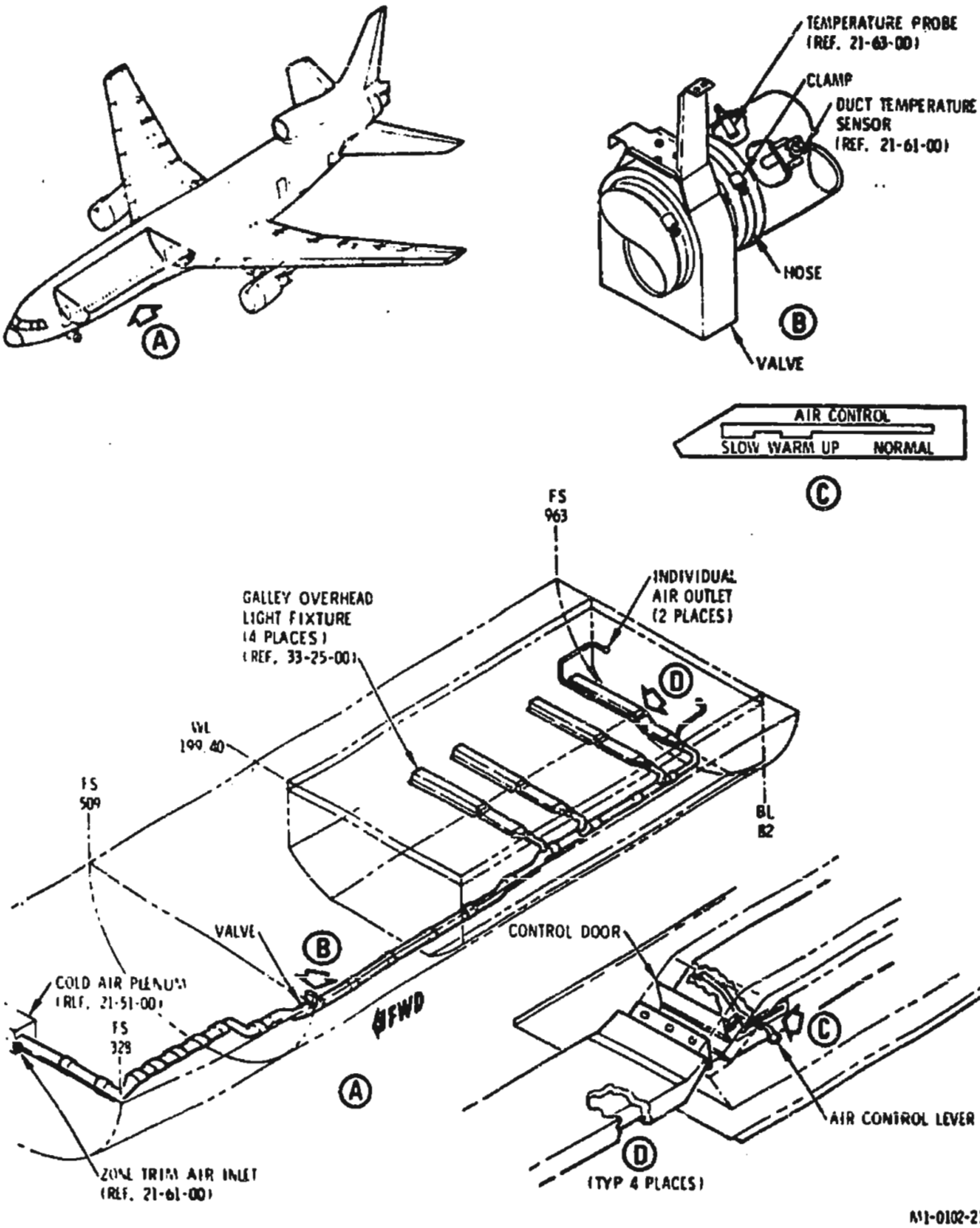
The galley exhaust airflow control valve is normally open, both in flight and on the ground, to provide positive scavenge and exhaust of galley heat and odors. The electrical actuator on the valve is used to provide positive valve closure when cabin air supply is appreciably lower than normal due to a malfunction in the air supply system (Ref. 21-21-00).

When the valve actuator is in the normally open position, the spring-loaded unbalanced disc valve plate is at its most open position (approximately 70 degrees from closed). The larger portion of the disc area is upstream, so air flowing through the valve attempts to close the disc against spring pressure. When the cabin is not pressurized, the springs hold the valve open to allow the full flow of galley air to pass from the exhaust fan.

As the cabin is pressurized, exhaust airflow from the galley begins to increase and the resulting unbalanced forces on the two sides of the valve disc cause the disc to rotate against spring pressure towards the closed position. As cabin pressure increases, increased flow is prevented by the valve disc moving further toward the closed position to maintain the calibrated maximum flow.

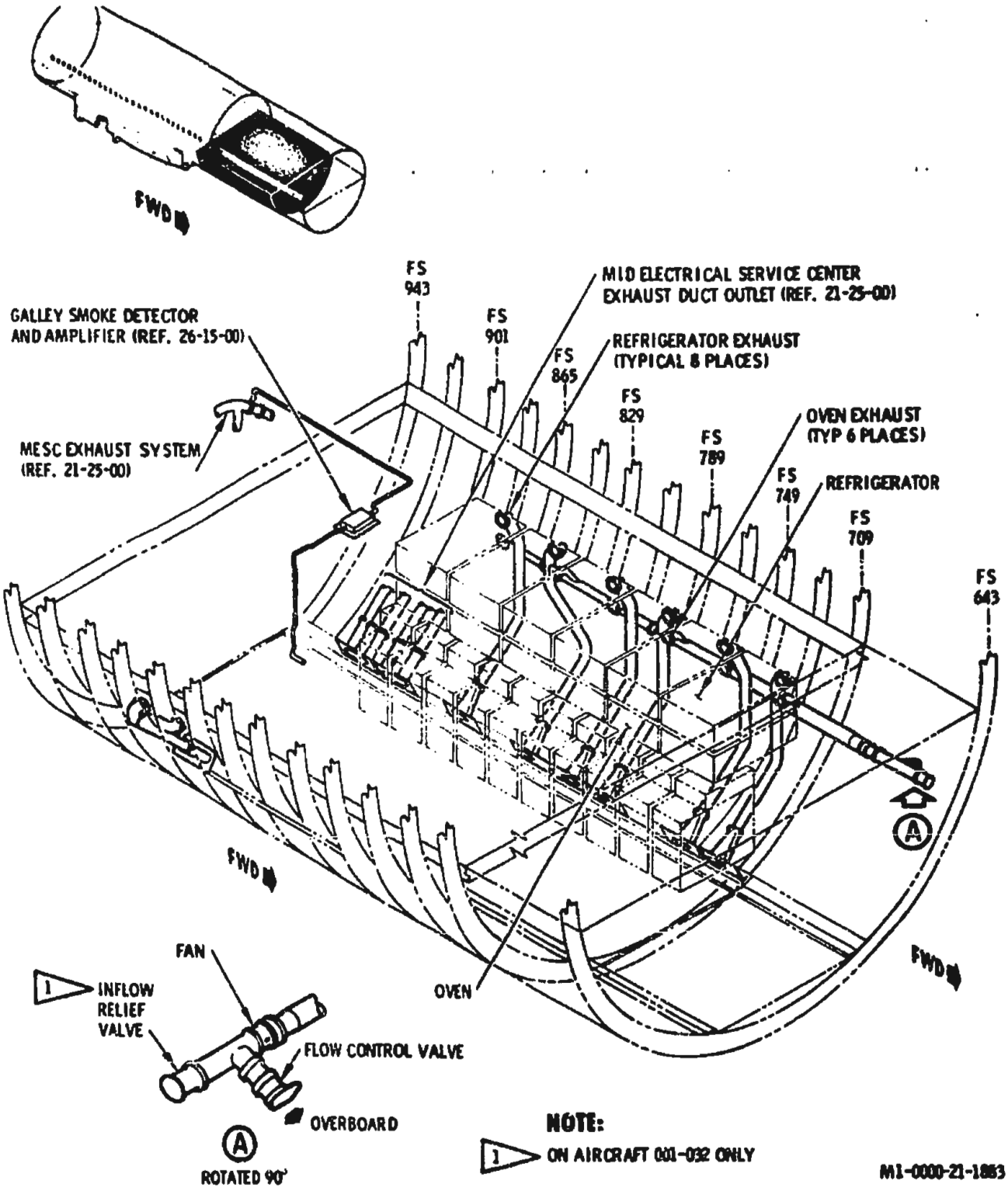
The control circuit (Ref. Fig. 4) for the galley exhaust airflow control valve is part of circuits also controlling the forward electronic and mid electrical service center compartment exhaust airflow control valves (Ref. 21-25-00). The valve close windings on all three valve actuators are energized and the CLOSE legend in the switchlight comes on when the COOL AIR OVBD switchlight on the Flight Engineer/Second Officers ESC MONITOR panel is released (out).

The galley exhaust valve opens when the switchlight is depressed (latched in) and the CLOSE legend goes out. The switchlight removes power from the close winding and transfers it to the open winding of the valve. At the same time, power is removed from the close winding of the forward electronic and mid electrical service center valves; however, the opening of these valves is controlled by other components in those systems.



A11-0102-21-047

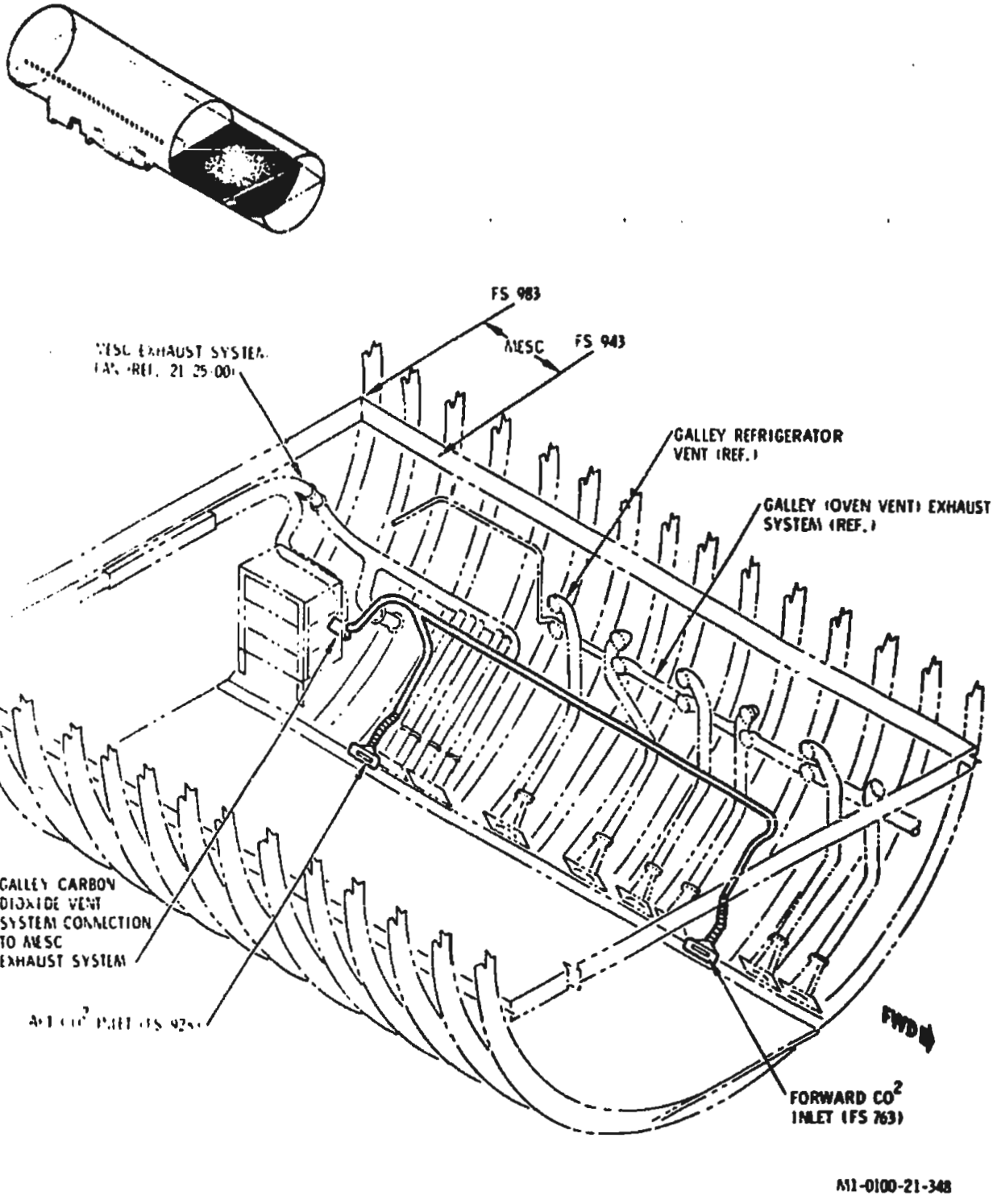
Galley Supply Air System
Figure 1



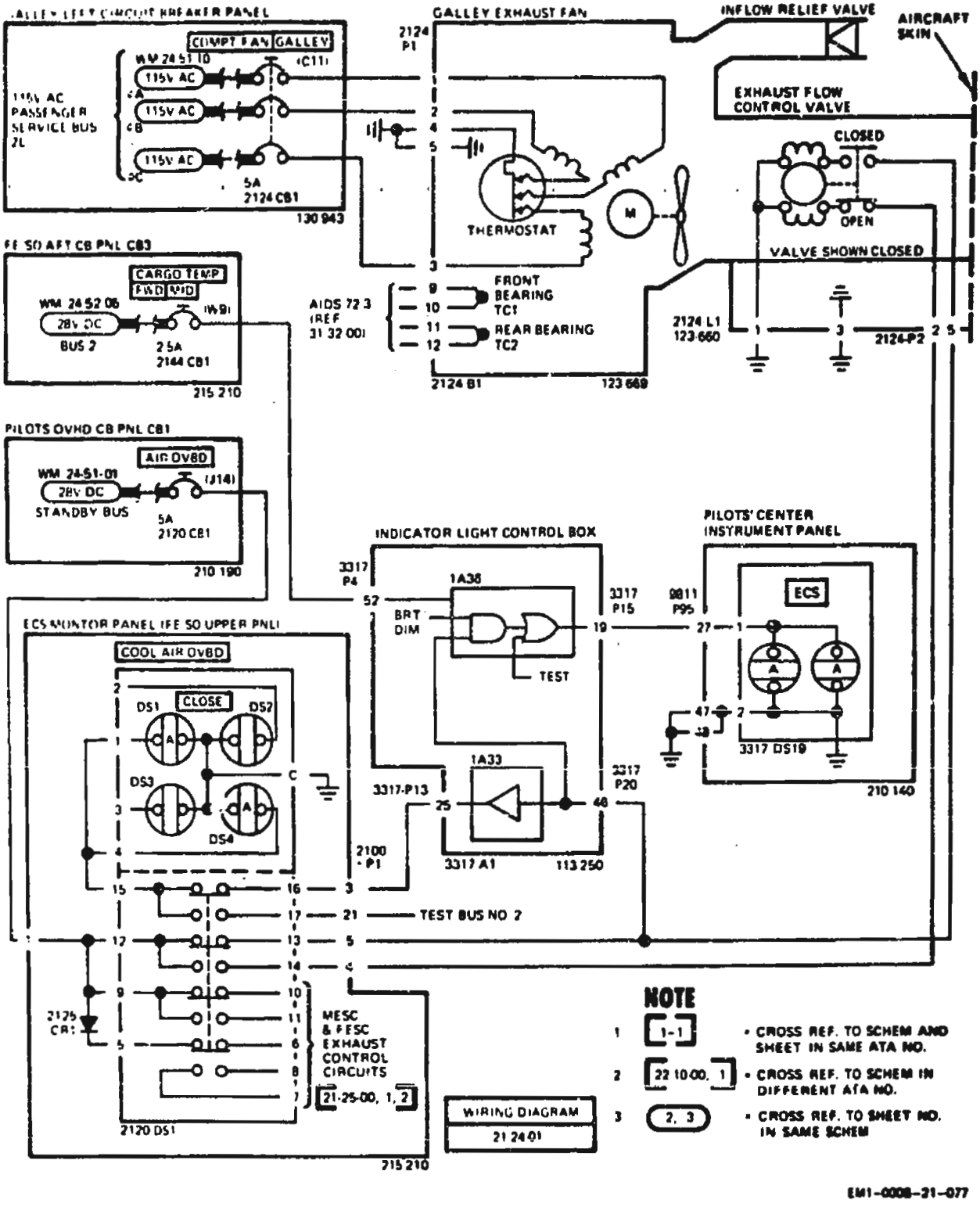
R
R

Galley Exhaust Air System
Figure 2

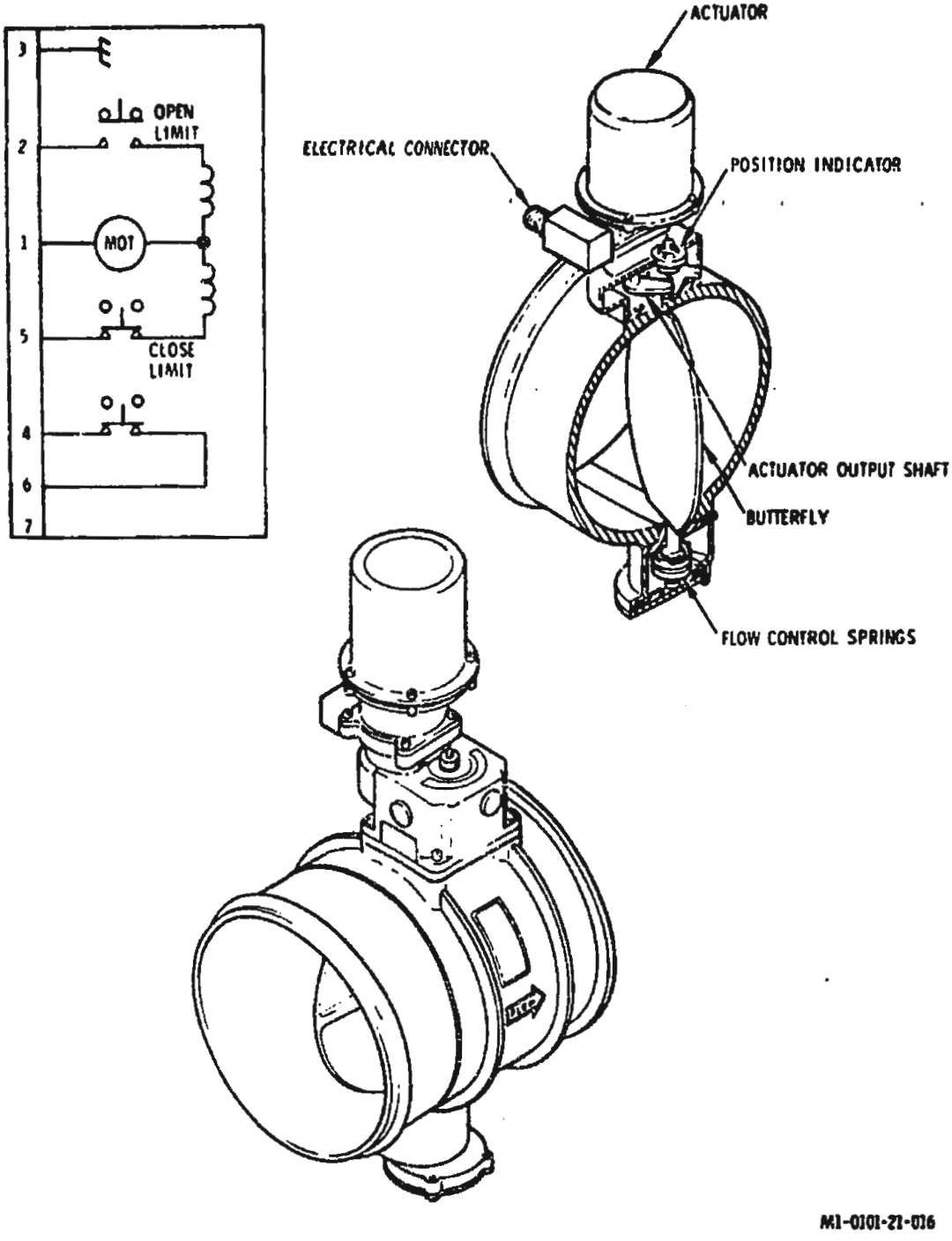
EFFECTIVITY: ALL



Galley Carbon Dioxide Vent System
Figure 3



Galley Exhaust System Control Schematic
Figure 4



Galley Exhaust Air Flow Control Valve
Figure 5

R
R

GALLEY SYSTEM
FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting galley system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the galley system. It gives the area and access of each component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Fault Isolation/Identification

Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
103	COOL AIR OVBD Light Problems
SCHEM 1	Galley Exhaust System Schematic

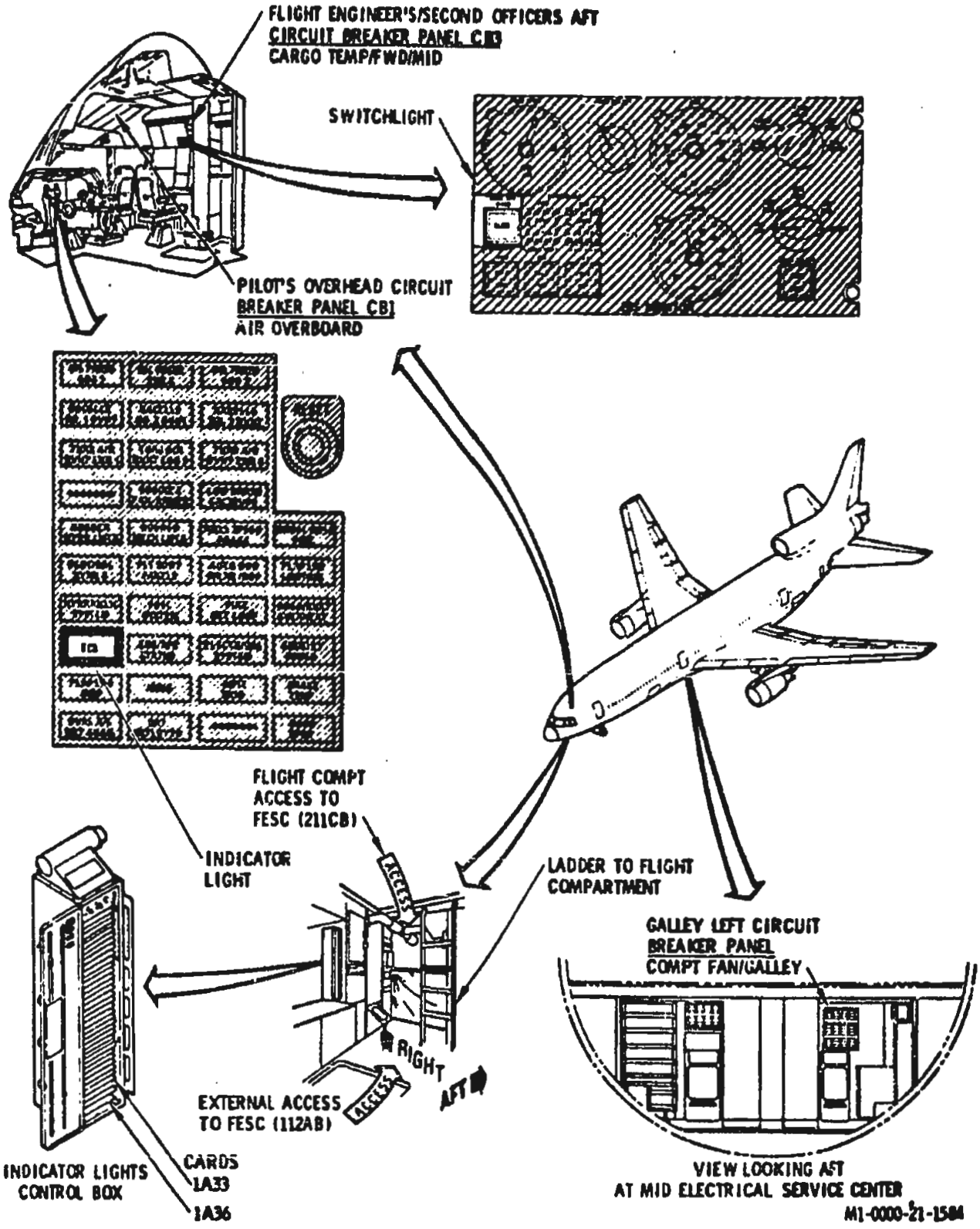
COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
AIR OVBD 2120-CB1	1	PILOT'S OVHD CB PNL CB1	•
CARGO TEMP/FWD/MID 2144-CB5	1	FE/SO AFT CB PNL CB3	•
COMPT FAN/GALLEY 2124-CB1	1	GALLEY LT CB PNL	•
CONTROL BOX, INDICATOR LIGHTS (ILCB):			
CARD 1A33 3317-A1	1	FESC/112A6	33-17-04
CARD 1A36 3317-A1	1	FESC/112AB	33-17-04
FAN, EXHAUST-GALLEY 2124-B1	1	OUTBD OF FWD CARGO COMPT/123KL	21-24-06
INDICATOR LIGHTS:			
ECS 3317-DS19	1	PILOT'S CENTER INSTR PNL	•
SWITCHLIGHTS:			
COOL AIR OVBD 2120-DS1	1	ECS MONITOR PNL/FE/SO UPPER PANEL	•
VALVE, CONTROL-EXHAUST AIR FLOW 2124-L1	1	OUTBD OF FWD CARGO COMPT/123AL	21-24-02
VALVE, CONTROL-SUPPLY AIR FLOW	1	OUTBD OF FWD CARGO COMPT, FS 509	21-24-01
VALVE, INFLOW RELIEF-EXHAUST DUCT	1	OUTBD OF FWD CARGO COMPT/123KL	21-24-07

*SEE WM EQUIPMENT LIST

M1-0000-21-1579

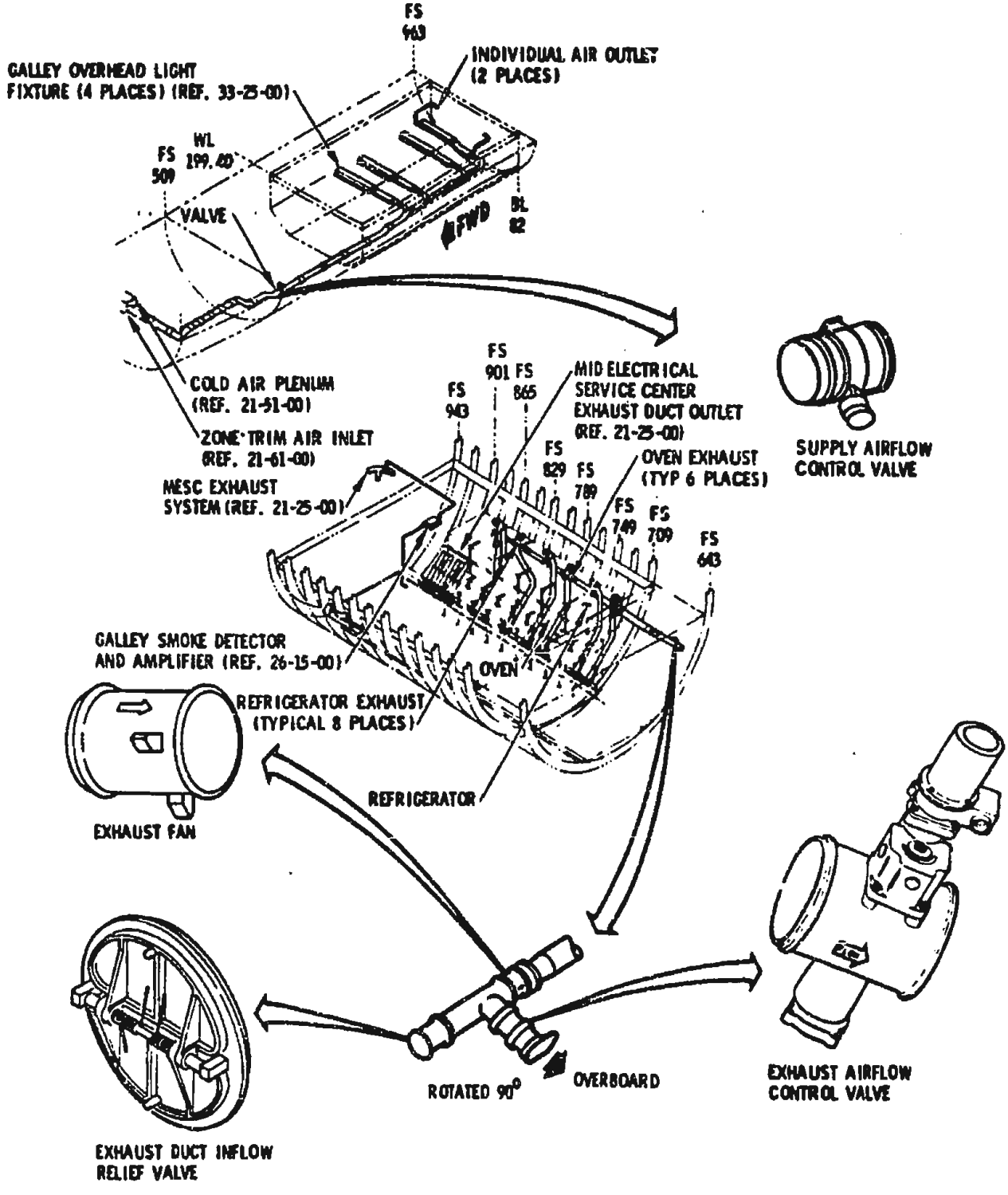
R
R Component Location Index
Figure 101

R EFFECTIVITY: ALL
R
0018



Component Locator Diagram
Figure 102 (Sheet 1)

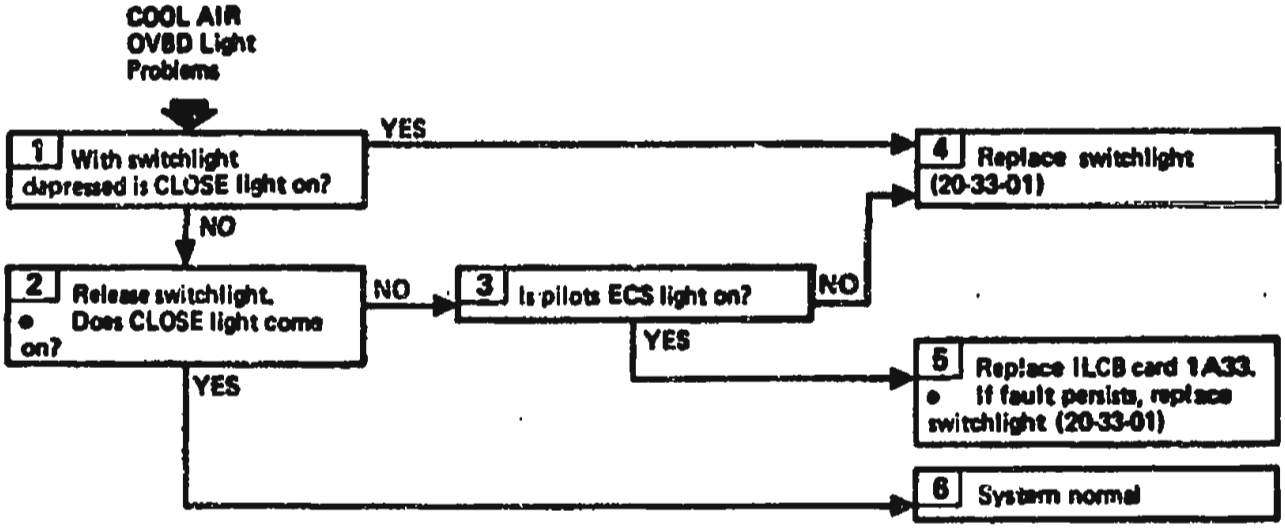
EFFECTIVITY: ALL



R Component Locator Diagram
R Figure 102 (Sheet 2)

R EFFECTIVITY: ALL

001B

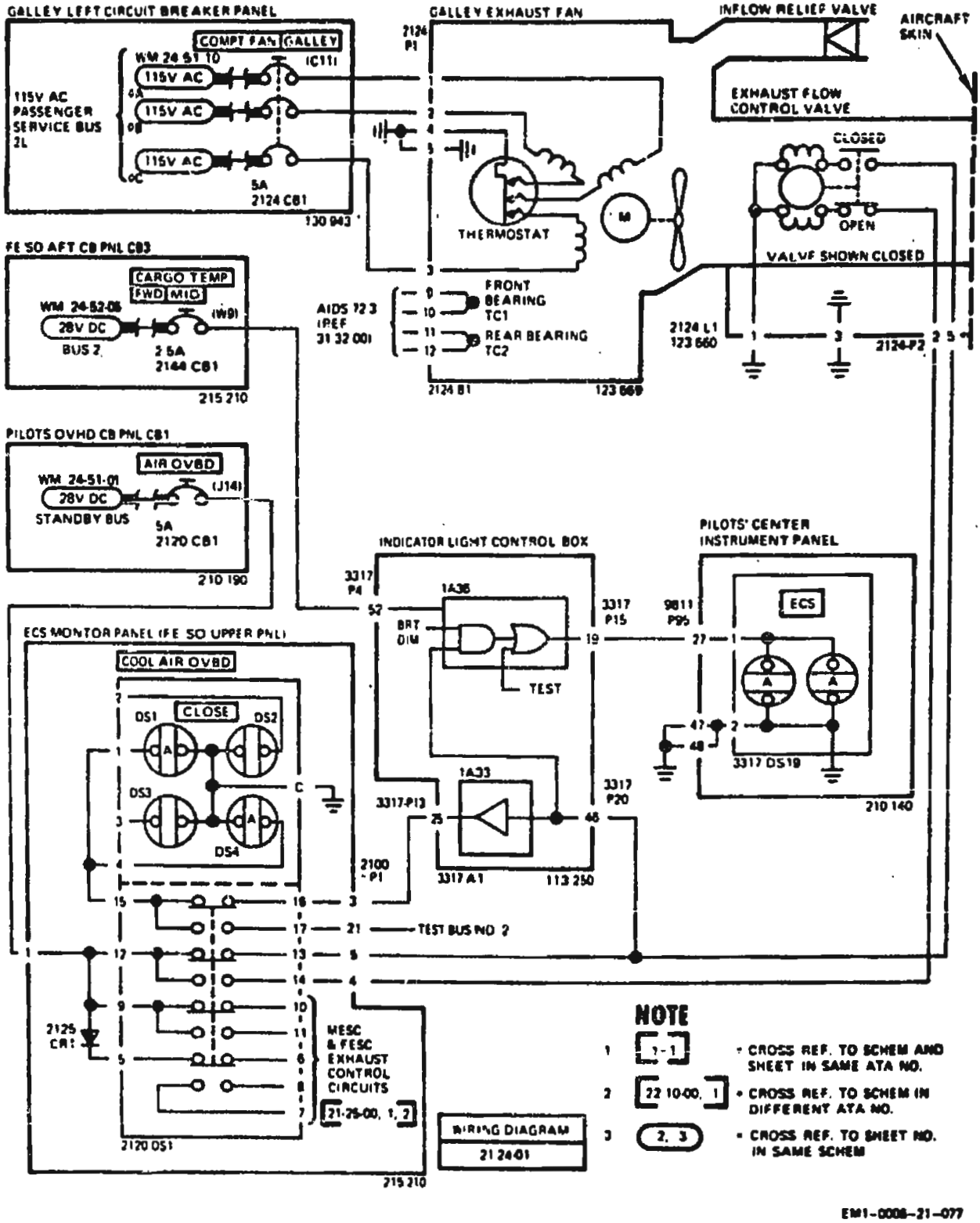


PREREQUISITES
Electrical Power
CB's: 1J14, 3W9

M1-65700-21-5110

R Cool Air OVBD Light Problems
R Figure 103

R EFFECTIVITY: ALL
R
001B



EM1-0008-21-077

Galley Exhaust System Schematic
SCHEM 1

EFFECTIVITY: ALL

001B

GALLEY SUPPLY AIR FLOW CONTROL VALVE - REMOVAL AND INSTALLATION

1. General

The galley supply airflow control valve is located in the left cheek area outboard of the forward cargo compartment, zone 123, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

3. Referenced Procedures

21-00-00	Air Conditioning System - Maintenance Practices
25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

R (1) Tag flight engineer/second officers bleed air and APU R control panels and the three high-pressure ground air R connections to prevent system operation until R completion of procedures.

R (2) Remove forward cargo compartment liner panel, FS 509, R (Ref. 25-51-06).

R (3) Remove insulation from airflow control valve (Ref. Fig. R 401).

R (4) Disconnect hose clamps and hoses from each end of R control valve, and slide clamps and hoses onto ducts.

R (5) Remove mounting bolts attaching control valve to R support bracket and remove control valve.

R (6) Install protective caps on duct openings.

B. Installation

(1) Remove protective caps from duct openings.

(2) Position control valve between ducts with airflow arrow pointing aft.

(3) Secure control valve to support bracket with mounting bolts.

(4) Work hoses into position on valve

(5) Install hose clamps and tighten.

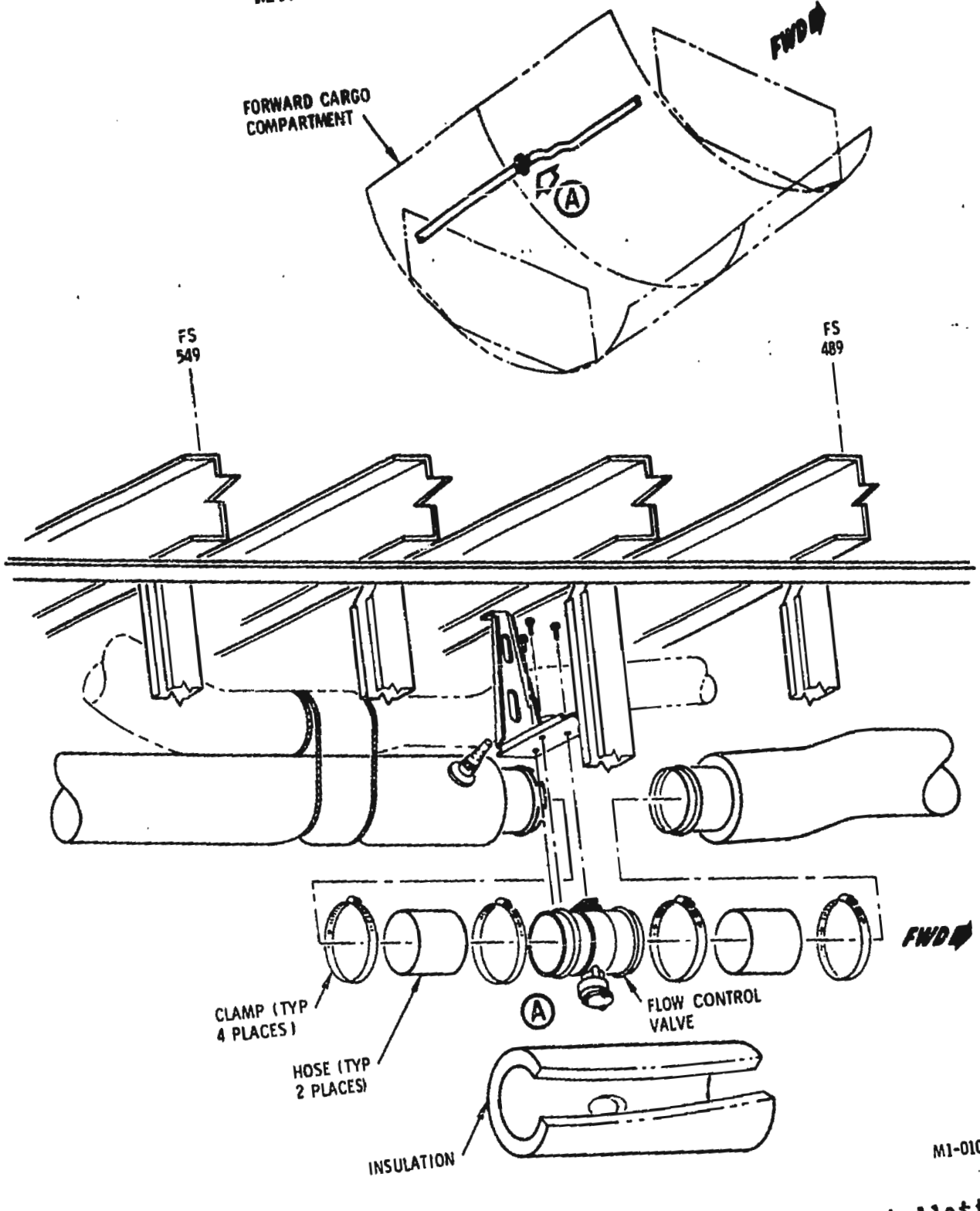
C. Operational Check

(1) Operate air conditioning system (Ref. 21-00-00) and check all disturbed connections for leakage and for controlled air flow to galley.

(2) Install insulation on control valve.

(3) Install cargo compartment liner panel (Ref. 25-51-06).

R (4) Remove tags installed in Step 4A(1).



Galley Supply Airflow Control Valve - Removal and Installation
Figure 401

R
R

EFFECTIVITY: ALL

050B

R GALLEY EXHAUST AIR FLOW CONTROL VALVE - MAINTENANCE PRACTICES

R 1. General

R The close function of the lower galley exhaust flow control valve may be inoperative with the valve in either the open or closed position. In the open position extended overwater flight is prohibited.

R In the closed position no operating restrictions apply.

R NOTE: The following procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

R 2. Maintenance Procedure

R A. Galley Exhaust Air Flow Control Valve Inoperative - Open

R (1) On FE/SO ECS MONITOR panel, placard COOL AIR OVBD switchlight GALLEY EXHAUST AIR FLOW CONTROL VALVE INOP. - OPEN.

R (2) Make appropriate entry in aircraft log book.

R B. Galley Exhaust Air Flow Control Valve Inoperative - Closed

R (1) On FE/SO ECS MONITOR panel, placard COOL AIR OVBD switchlight GALLEY EXHAUST AIR FLOW CONTROL VALVE INOP. - CLOSED.

R (2) Make appropriate entry in aircraft log book.

GALLEY EXHAUST AIR FLOW CONTROL VALVE - REMOVAL AND INSTALLATION

1. General

The galley exhaust air flow control valve is located in the left cheek area outboard of the forward cargo compartment, zone 123, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

O-ring, MS9068-250, or equivalent

Lock-wire, 0.020-inch diameter, Fed Spec QQ-W-390, Cond A, or equivalent

3. Referenced Procedures

6-50-00	Interior Access Doors and Panels
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-24-02	Galley Exhaust Air Flow Control Valve - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

(1) On galley left circuit breaker panel, zone 131, open and tag circuit breaker COMPT FAN - GALLEY (C11).

R (2) On pilots overhead circuit breaker panel CB1, zone 215, open and tag circuit breaker AIR - OVBD (J14).

(3) Remove forward cargo compartment access panel 123AL (Ref. 6-50-00).

(4) Disconnect electrical cable from flow control valve.

(5) Install protective caps on cable connector and control valve receptacle.

(6) Remove band clamp and hose from upper end of control valve.

(7) Remove T-bolt V-band coupling (Ref. 20-36-01) from lower end of control valve.

(8) Remove control valve and O-ring, and discard O-ring.

(9) Install protective caps on duct openings.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) and 4A(2) are open and tagged.

(2) Remove protective caps from duct openings.

(3) Install O-ring and position control valve between ducts with control valve airflow arrow pointing outboard.

(4) Install T-bolt V-band coupling on outboard end of control valve and overboard duct (Ref. 20-36-01).

(5) Install hose and band clamps on inboard end of control valve and supply duct.

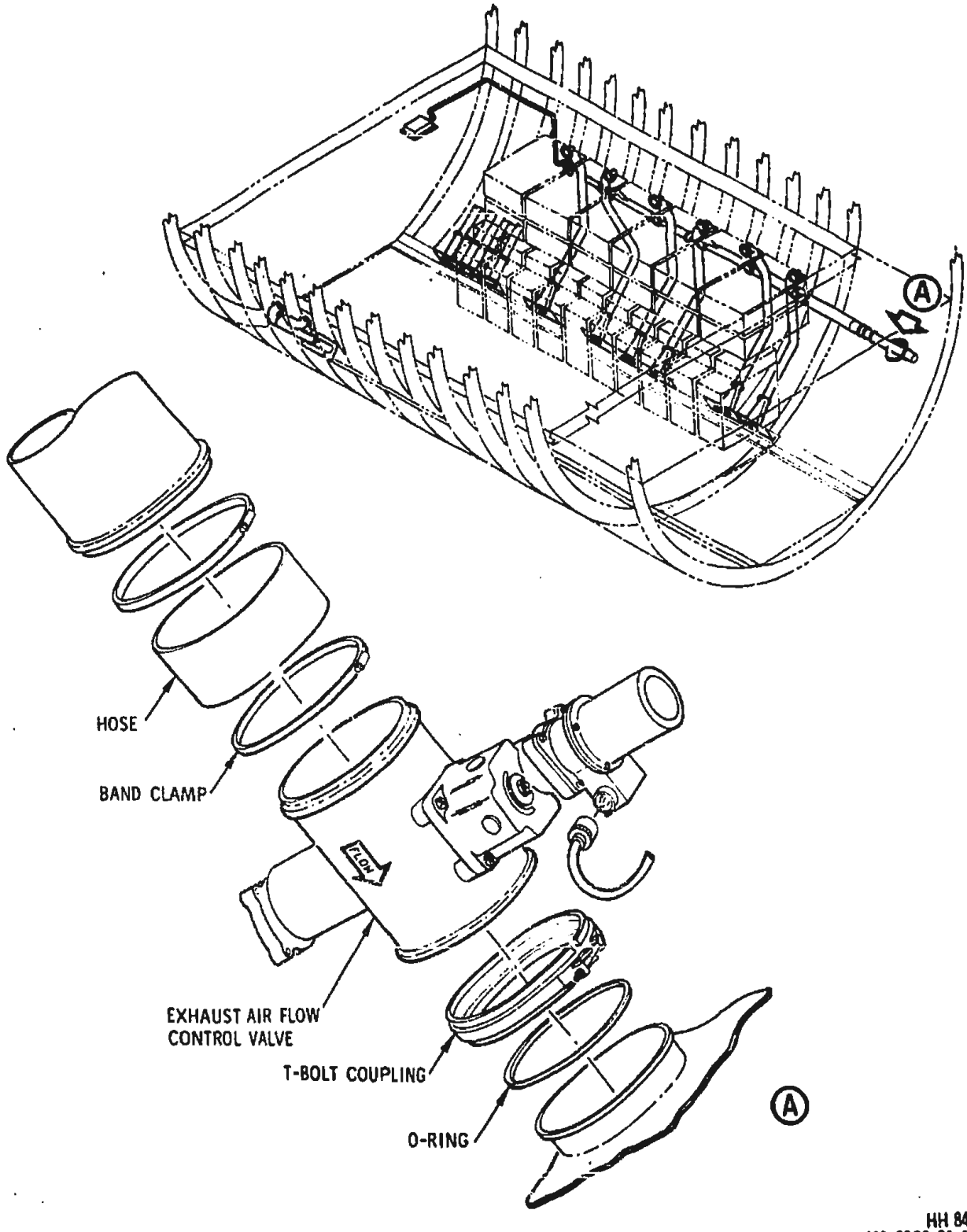
(6) Remove protective caps and connect electrical cable to control valve and lock-wire.

(7) Remove tags and close circuit breakers opened in Steps 4A(1) and 4A(2).

R R (8) Turn on electrical power (Ref. 24-00-00) and make operational check of flow control valve (Ref. 21-24-02).

R (9) Install cargo compartment liner.

(10) Turn off electrical power (Ref. 24-00-00).



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1515520

Galley Exhaust Air Flow Control Valve
Removal and Installation
Figure 401

GALLEY EXHAUST AIR FLOW CONTROL VALVE - ADJUSTMENT AND TEST

1. General

The exhaust flow control valve adjustments must be made in the shop. The following test procedure will provide a go/no-go indication of operation in the aircraft. If test results are unsatisfactory, the valve must be removed and sent to the shop for adjustment.

2. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

25-51-06 Forward Cargo Compartment Liner - Removal and Installation

3. Adjustment/Test

A. Operational Check

(1) Turn on electrical power (Ref. 24-00-00).

R (2) Verify the following circuit breakers are closed.

R (a) On pilots overhead circuit breaker panel CB1, zone
R 210:

R AIR - OVBD (J14).

R (b) On Flight Engineer/Second Officers aft circuit
R breaker panel CB3, zone 215:

R CARGO TEMP - FWD - MID (W9).

R (c) On galley left circuit breaker panel, zone 137:

R COMPT FAN - GALLEY (11C).

(3) On FE/SO ECS MONITOR panel, zone 215, depress COOL AIR OVBD switchlight. Verify CLOSE light goes out.

(4) Verify air is blowing out of exhaust duct on left side of airplane at approximately FS660.

(5) On FE/SO ECS MONITOR panel, release COOL AIR OVBD switchlight. Verify that air stops blowing within 15

seconds. The CLOSE light in switchlight must come on when valve is closed.

(6) Depress COOL AIR OVBD switchlight, and verify that air starts blowing within 15 seconds.

(7) Turn off electrical power (Ref. 24-00-00).

GALLEY EXHAUST FAN - MAINTENANCE PRACTICES

1. General

R The galley exhaust fan may be inoperative provided the galley
R exhaust air flow control valve (21-24-02) is operative, and the
R Mid Electrical Service Center exhaust fan (21-25-04) is
R operative during ground operations.

The galley exhaust fan evacuates air from the galley and exhausts the air overboard through the galley exhaust valve. When the cabin is pressurized, cabin differential pressure assists the fan.

R 2. Equipment and Materials

R Protective Caps

R 3. Referenced Procedures

R 24-00-00 Electrical Power - Maintenance Practices

R 25-52-06 Forward Cargo Compartment Liner - Removal and
R Installationand Installation

R 4. Maintenance Practices

A. Deactivation

R (1) On the galley left circuit breaker panel, open and
R collar circuit breaker COMPT FAN - GALLEY (C11).

R (2) Remove forward cargo compartment liner panel 123KL
R (Ref. 25-21-06), zone 123.

R (3) Disconnect electrical cable connector from exhaust fan
R receptacle (Ref. Fig. 201).

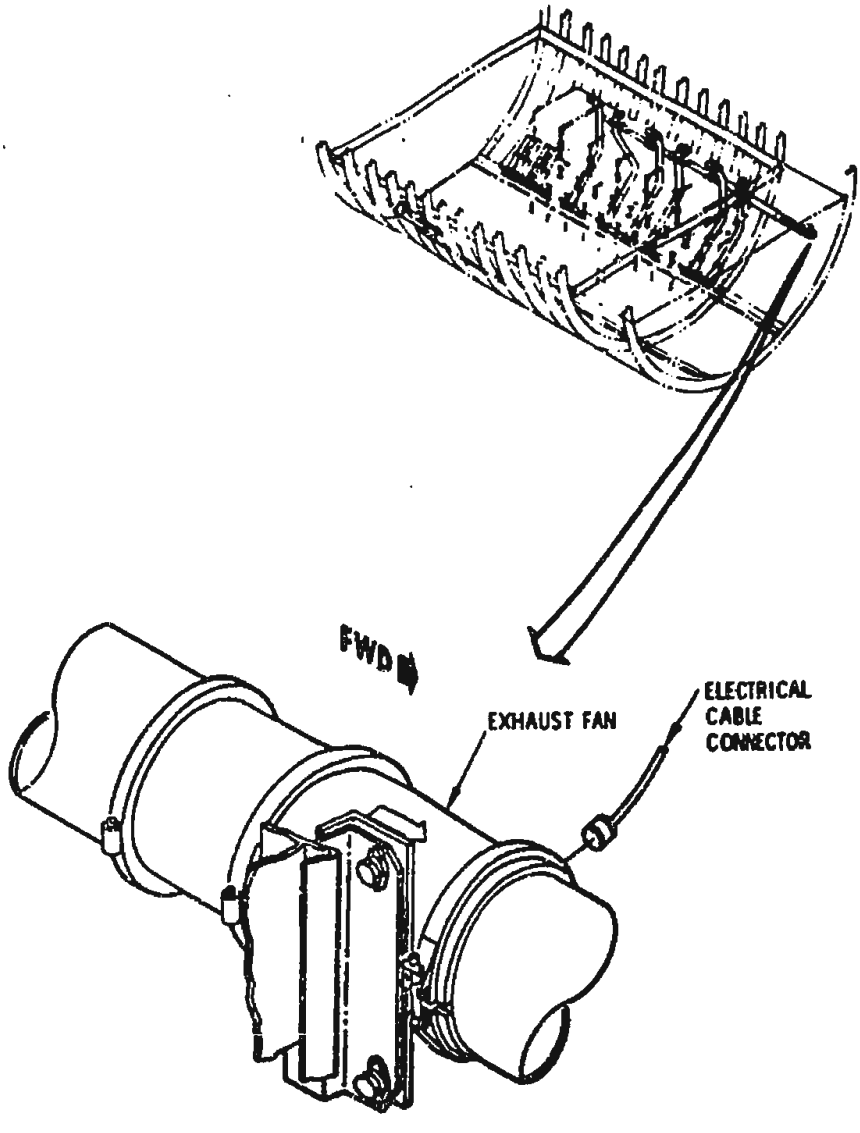
R (4) Install protective cap on electrical cable connector
R and stow.

R (5) Install protective cap on exhaust fan receptacle.

R (6) Install compartment liner.

R (7) On Flight Engineer/Second Officers ECS MONITOR panel
R placard COOL AIR OVBD switchlight GALLEY EXHAUST FAN
R INOPERATIVE.

R (8) Make appropriate entry in aircraft log book.



M1-60B00-21-1075

R Galley Exhaust Fan — Maintenance Practices
R Figure 201

GALLEY EXHAUST FAN - REMOVAL AND INSTALLATION

1. General

The galley exhaust fan is located in the left cheek area outboard of the forward cargo compartment, zone 123, (Ref. Fig. 401).

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices
25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

R (1) On galley left circuit breaker panel, zone 131, open and tag circuit breaker COMPT FAN - GALLEY (C11).

(2) Remove forward cargo compartment liner panel 123 KL (Ref. 25-51-06), zone 123.

(3) Disconnect electrical cable connector from exhaust fan receptacle.

(4) Install protective caps on cable connector and fan receptacle.

(5) Remove T-bolt coupling (Ref. 20-36-01) from forward end of exhaust fan. Slide coupling onto duct.

(6) Remove fan mounting bolts (Ref. Fig. 401).

(7) Remove band clamp, work hose from aft end of exhaust fan and remove fan.

(8) Install protective caps on duct openings.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective caps from duct openings.

(3) Position fan near mounting support, with air flow arrow pointing forward, work fan into hose, and bolt fan to
R mounting bracket (Ref. Fig. 401).

(4) Install band clamp on hose on aft end of fan.

(5) Install single T-bolt V-band coupling on forward end of fan (Ref. 20-36-01).

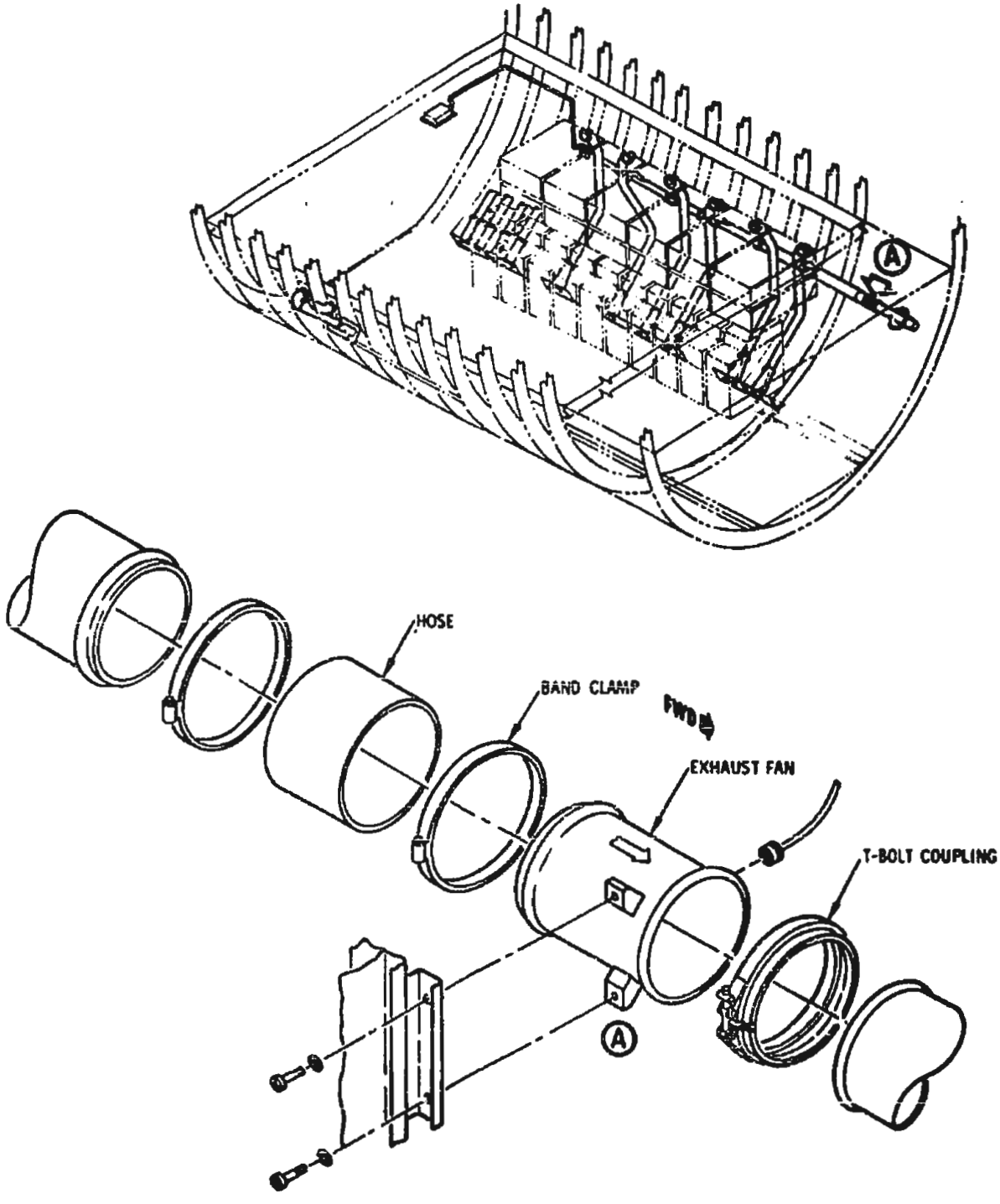
(6) Remove protective caps and connect electrical cable to fan.

(7) Remove tag and close circuit breaker opened in Step 4A(1).

(8) Turn on electrical power (Ref. 24-00-00) and verify fan operation.

(9) Turn off electrical power (Ref. 24-00-00).

(10) Install cargo compartment liner panel (Ref. 25-51-06).



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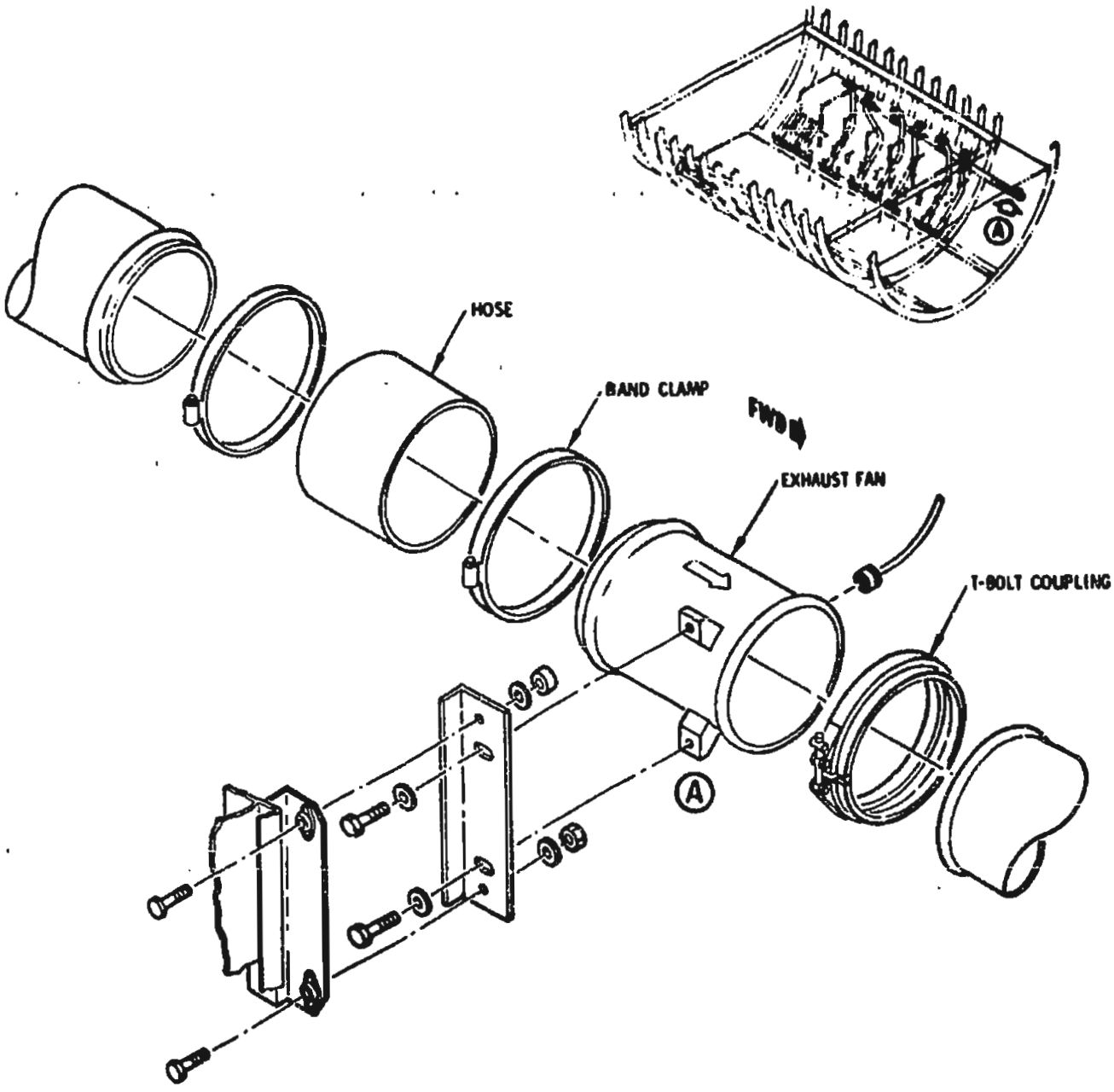
R Galley Exhaust Fan - Removal and Installation
R Figure 401

R EFFECTIVITY: 001-025 WITHOUT SB21-090



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Galley Exhaust Fan - Removal and Installation
Figure 401

GALLEY EXHAUST FAN - ADJUSTMENT AND TEST

1. General

The galley exhaust fan provides positive scavenging of heat and odors from the galley area. The scavenged air is exhausted into a duct outboard of the left side of the galley. From here the air is ducted forward through the exhaust fan and dumped overboard at a point outboard of the left aft corner of the forward cargo compartment, zone 123.

The fan is mounted in the duct near the exhaust outlet.

Adjustment of the fan must be made in the shop. Testing of the fan consists of checking for proper air flow and of listening to the operating fan motor for rubbing blades or other excessive noises.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) Turn on electrical power (Ref. 24-00-00).

R (2) On ECS MONITOR panel, zone 215, place COOL AIR OVBD
R switchlight in depressed (latched in) position.

(3) Check for air flow from exhaust air outlet, forward and below the left wing fillet.

NOTE: If air flow is normal and excessive noises are
R not present, exhaust fan is presumed to be in operable condition.

R R

GALLEY EXHAUST DUCT INFLOW RELIEF VALVE REMOVAL AND INSTALLATION

1. General

The galley exhaust duct inflow relief valve is located in the left cheek area outboard of the forward cargo compartment, zone 123, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

3. Referenced Procedure

20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

(1) On galley left circuit breaker panel, zone 130, open and tag circuit breaker COMPT FAN - GALLEY (11C).

(2) Remove forward cargo compartment liner panel 123 KL (Ref. 25-51-06), zone 123.

(3) Remove V-band coupling which secures valve to T-duct (Ref. 20-36-01).

(4) Remove relief valve.

(5) Install protective cap on duct opening.

B. Installation

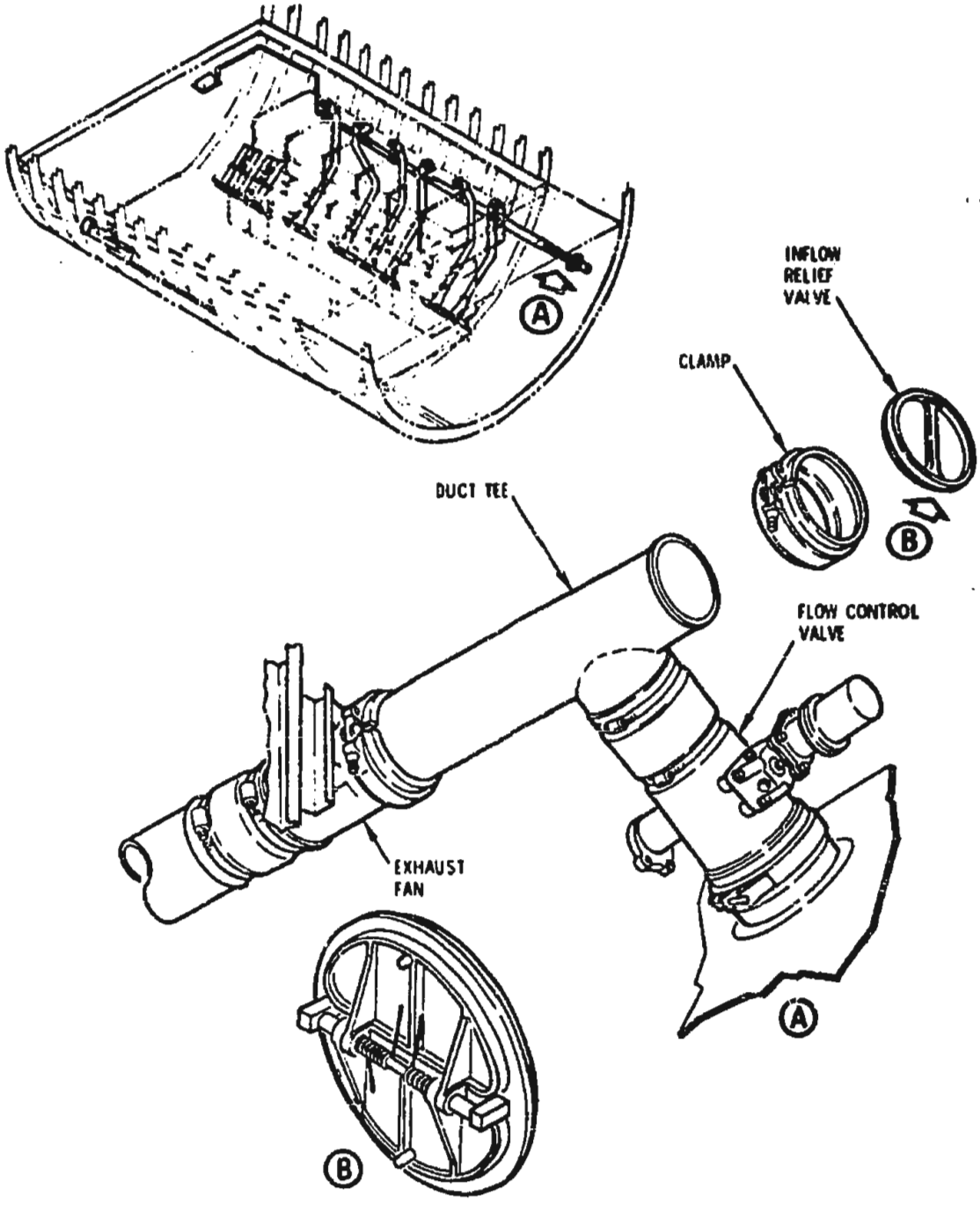
(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective cap from duct opening.

(3) Install relief valve on T-duct and secure with V-band coupling (Ref. 20-36-01).

(4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Remove tag and close circuit breaker opened in Step 4A(1).



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R Galley Exhaust Duct Inflow Relief Valve
R Removal and Installation
R Figure 401

GALLEY DUCTING AND CONNECTORS - INSPECTION

C 1. Equipment and Material

C Plywood Support Board - .025 X 42 X 27.75 inches.

C 2. Referenced Procedures

C 25-31-06 Refrigerator Units - Removal/Installation.

C 25-51-06 Forward Cargo Compartment Liner Panels -
C Removal/Installation.

C 3. Inspection and Check

C A. Remove Forward Cargo Compartment Liner 123KL, Reference
C 25-51-06.

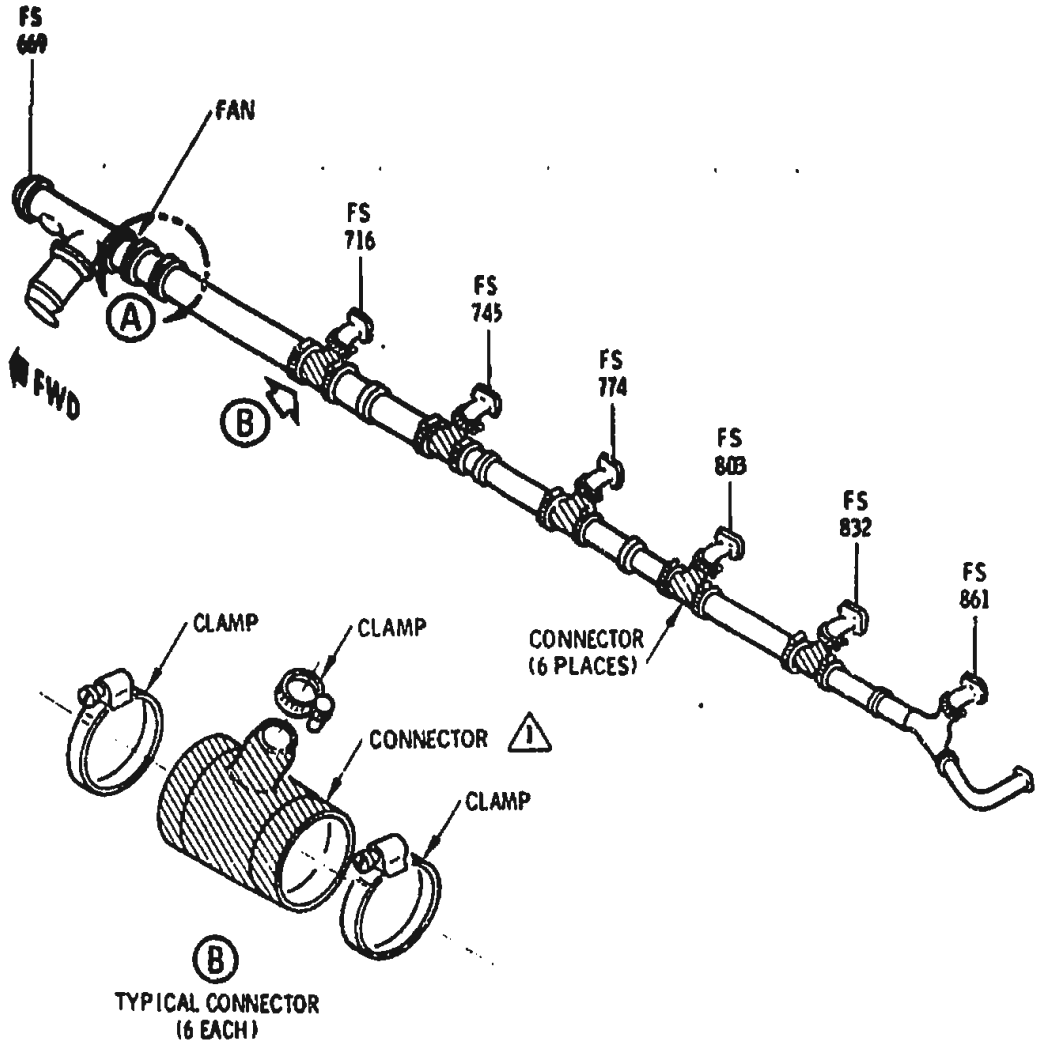
C B. Remove all Refrigerator Units, Reference 25-31-06.

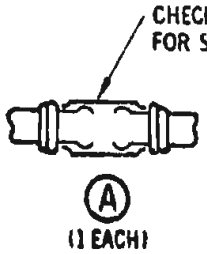
C C. Using support board at each refrigerator bay, gain access
C through refrigerator inlet air hole and make hand feel check
CR of each air duct connector (6 each) of the oven exhaust duct
C system. Also check sleeve type connector (fwd cargo
C compartment). See Figure 601 and 602.

C D. Connectors shall be firm with no evidence of any spongeness
C or deterioration.

C E. Replace Rejected Air Duct Connectors.

C F. Return Aircraft to Normal.





NOTE

1 CROSS-HATCHED AREA OF EACH AIR DUCT CONNECTOR MUST BE FIRM. NO SPONGINESS ALLOWED.
THIS VIEW APPLICABLE TO AIRCRAFT 11008 AND SUBSEQUENT

2 INSULATION REMOVED FROM DUCT SECTIONS FOR CLARITY

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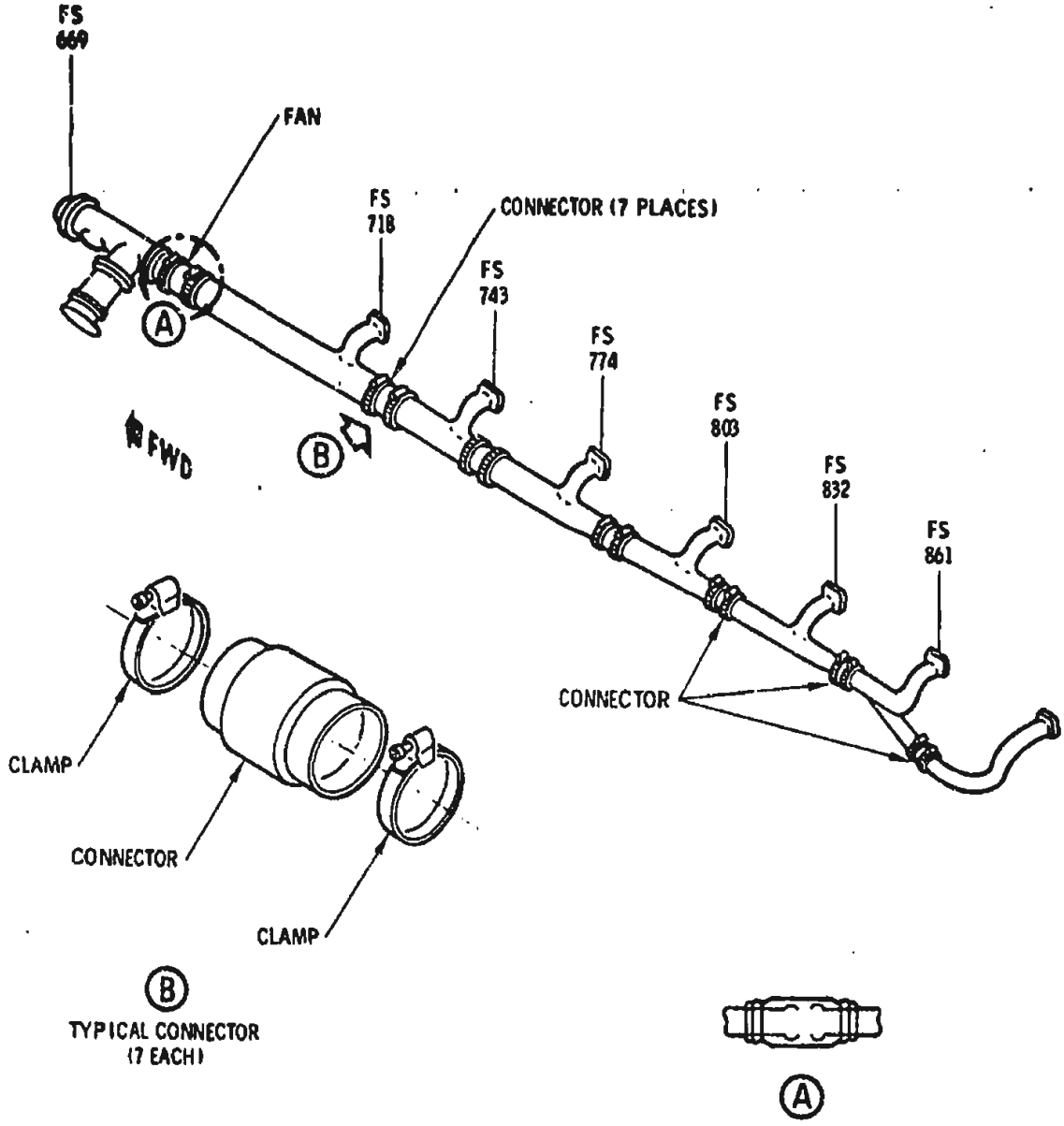
CR
CR

Galley Oven Exhaust Ducting
Figure 601



NOTE

1. SLEEVE CONNECTS METAL DUCTS ONLY. CENTER PORTION APPROXIMATELY ONE HALF INCH WIDTH IS EXPOSED TO AN OVERHEAT CONDITION
2. INSULATION REMOVED FROM DUCT SECTIONS FOR CLARITY

M1-0001-21-1903

CR
CR

Galley Oven Exhaust Ducting
Figure 602

EFFECTIVITY: 001-006

004B

R
R

GALLEY OVEN EXHAUST DUCTING CLEANING AND PAINTING

1. General

The galley oven exhaust ducts provide a positive scavenging system of heat and odors from each galley oven and discharge directly overboard with a constant flow rate during in flight or on the ground. The galley oven exhaust heat and odors are exhausted into ducts located in the galley left Cheek Area, zone 133 (Ref. Fig. 701).

2. Equipment and Materials

Brush Nylon Series 90 or equivalent (equipped with 17-foot-long segmented handle). The handle should consist of 2 or 3 segments. Brush working diameter varies from 2-1/2 to 6 inches. Brush Research, 4353 E. Floral Drive, Los Angeles, Ca., 90022

Cleaning Solution, Air Tech No. 10, Turco Products Co., or equivalent

Plastic Sheeting

O-Ring, MS9068-250, or equivalent

Protective Caps

Protective Support Board; 1/4 inch plywood 42 inches X 27.75 inches or equivalent.

3. Referenced Procedures

6-40-00	Exterior Access Doors and Panels
20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-24-06	Galley Exhaust Fan - Removal and Installation
25-31-05	Galley Ovens - Removal and Installation
25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation
26-15-06	Exhaust Duct Overheat Thermal Switch - Removal and Installation

R 4. Cleaning/Painting

A. Preparation

(1) On pilots overhead circuit breaker panel, CB1, zone 210, open and tag circuit breaker AIR - OVBD (J14).

(2) On galley left circuit breaker panel, zone 130, open and tag circuit breakers as follows:

COMPT FAN - Galley (C11)

GALLEY-SMOKE-DETECT (E22)

(3) On galley right circuit breaker panel, zone 130, open and tag circuit breakers as follows:

OVEN 1, 2, 3, 4, 5 and 6 (E16, E17, E18, E19, E20 and F16. (If installed)

(4) Open lower galley access door 822 (Ref. 6-40-00).

(5) Remove galley ovens (Ref. 25-31-05).

(6) Remove forward cargo compartment liner panel to gain access for fan, valve and sensor (Ref. 25-51-06).

(7) Disconnect electrical connectors from fan, control valve and temperature sensor (Ref. Fig. 701).

(8) Install protective caps on electrical connectors and component receptacles.

C (9) Remove band clamp from aft hose end attached to duct
C assembly near flame arrestor.

C (a) Remove duct assembly P/N G00808-1 (fwd service
C center exhaust system) with orifice and flame
C arrestor.

C NOTE: This is required to provide access to the
C duct section behind the galley.

C (b) Remove flame arrestor from duct assembly G00808-1
C and clean separately. To insure all passages are
C open and all contaminates are removed.

C (c) Clean duct assembly with installed orifice and
C re-install flame arrestor.

R (10) Remove T-bolt V-band coupling (Ref. 20-36-01) between
R exhaust vent overboard and galley exhaust flow control
R valve. Discard O-ring.

R (11) Support fan, control valve and T-duct assembly and
R remove fan mounting bolts (Ref. 21-24-06). Remove fan,
R valve and T-duct as an entire assembly (Ref. Fig. 701).

R (12) Install protective caps on galley exhaust flow control
R valve and fan. Place entire T-duct assembly on work
R bench for disassembly and cleaning.

R (13) Remove exhaust duct overheat thermal switch (Ref.
R 26-15-06)

R (14) Cover area under end of duct assembly with plastic
R sheeting, and absorbant rags or suitable collector to
R prevent cleaning solution from getting into bilge or on
R equipment.

R B. Cleaning/Installation

R (1) Verify circuit breakers opened in Step 4A(1) (2) and
R (3) are open and tagged.

R CAUTION: PREVENT EXCESS CLEANING SOLUTION FROM GETTING INTO
R BILGE OR ON EQUIPMENT NEARBY.

R (2) Insert appropriate size long-handle duct cleaning brush
R into end of duct opening, and swab out inside of duct.
R Withdraw brush at intervals, dependent on amount of
R contaminant, and wash out in cleaning solution.

R NOTE: Shake or squeeze excess cleaning solution out of
R brush before continuing cleaning. Brush should
R be damp, but not dripping wet.

R (3) Continue swabbing until the exhaust duct assembly is
R cleaned and clear of greasy or tacky substance.

R NOTE: Galley oven tuskers duct openings may be cleaned
R simultaneously during galley oven exhaust duct
R cleaning.

R (4) Install protective support board in galley oven rack
R (oven removed) prior to cleaning tusker opening/ducts.

R (5) Cover area under tusker duct openings with plastic
R sheeting, and absorbant rags or suitable collector to
R prevent cleaning solution from getting on galley
R equipment.

R (6) Insert appropriate size brush into galley oven exhaust tusker duct opening. Swab cleaning solution into tusker openings and withdraw brush at intervals until tusker duct openings are cleaned. Repeat this cleaning step for each galley oven exhaust tusker duct as required.

R (7) Make final visual check inside tusker duct openings and duct assembly to ensure tuskers and ducts are cleaned and dry.

R (8) Remove plastic sheeting and rags used to catch excess cleaning solution.

R (9) Install exhaust duct overheat thermal switch, removed in Step 4A(13).

R (10) Remove protective caps from fan, control valve and T-duct assembly.

R (11) Install T-duct assembly and secure fan with mounting bolts, removed in Step 4A(11).

R (12) Install O-ring on galley exhaust flow control valve.

R (13) Install T-bolt V-band coupling on flow control valve removed in Step 4A(10).

R (14) Install band clamp removed in Step 4A(9).

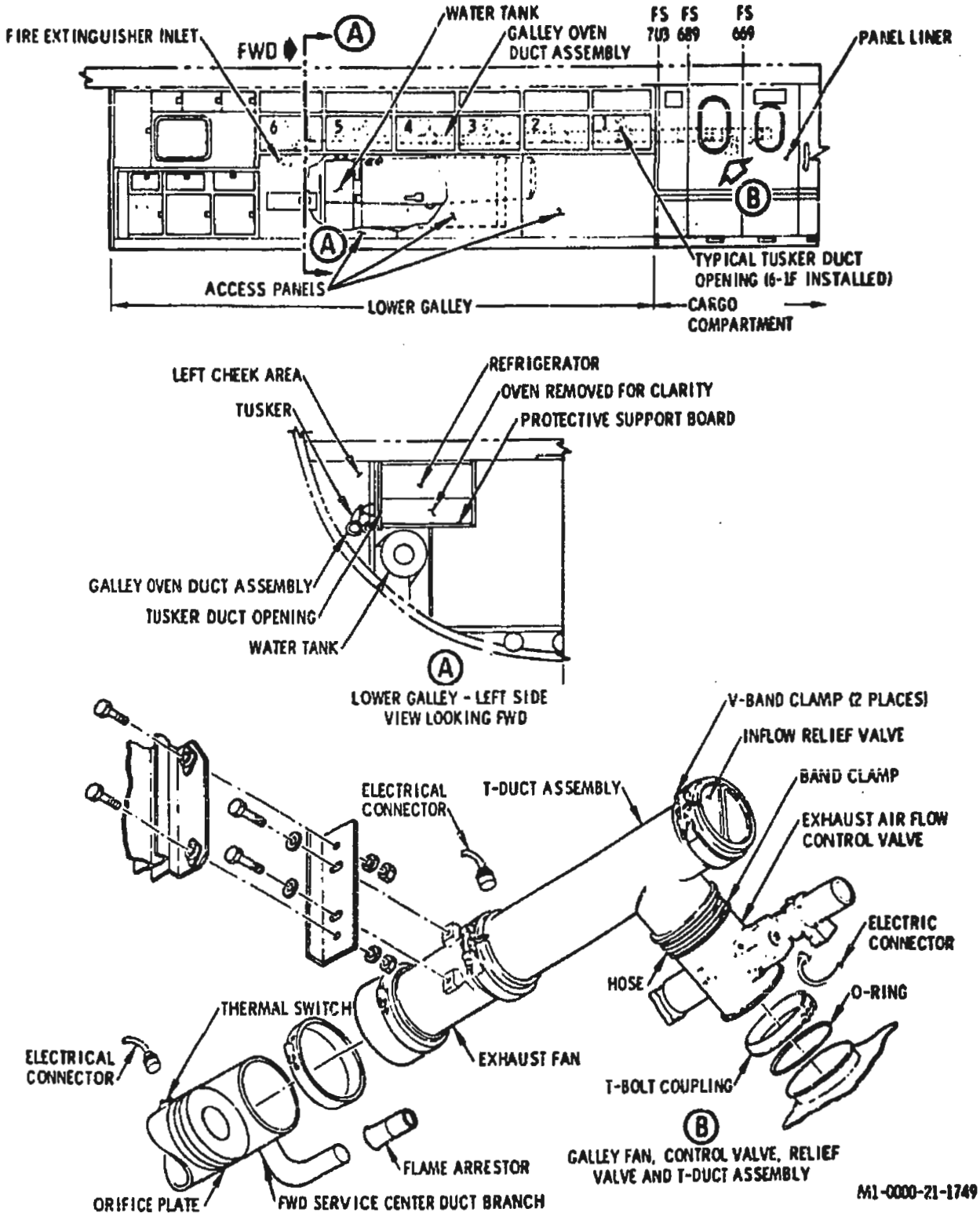
R (15) Install electrical connector on components, removed in Step 4A(7).

R (16) Remove protective support board installed in Step 4B(4).

R (17) Install galley ovens (Ref. 25-31-06).

R (18) Remove tags and close circuit breakers opened in Steps 4A(1), (2) and (3). Verify galley exhaust fan is operational.

R (19) Install forward cargo compartment liner panel (Ref. 25-61-06).



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Galley Oven Exhaust Ducting - Cleaning
Figure 701

R
R
001B

EFFECTIVITY: ALL

GALLEY OVEN EXHAUST DUCT HIGH TEMP AIR CONNECTOR REMOVAL AND INSTALLATION

1. General

Galley oven exhaust duct high temp air connectors, made of heat resistant resin coated fiberglass with silicone rubber ends to aid in removal and installation.

On aircraft 001-006, the connectors sleeve type connected to galley oven exhaust system and held in position by two clamps (Ref. Fig. 401).

On aircraft 007-999,

theconnectors T type, connected to galley oven exhaust system and held in position by three clamps (Ref. Fig. 401).

2. Reference Procedure

38-11-00	Draining, Sterilization and Purification Potable Water System Maintenance Practices
38-12-01	Tank - Potable Water Removal and Installation
12-15-01	Potable Water Tank - Replenishing
25-51-13	Sidewall Liner Blowout Panel Removal and Installation

3. Removal/Installation

A. Removal

(1) On galley right circuit breaker panel, zone 130, open and tag circuit breakers as follows:

COMPT FAN-GALLEY (C11)

OVEN 1, 2, 3, 4, 5 and 6 (E16, E17, E18, E19, E20 and F16)

(2) Remove access panels (133CL, 133BL, 133AL) located below oven galley rack (Ref. Fig. 401).

NOTE: Removal of position 1 connector, (if installed), does not require removal of water tank.

R (3) Drain potable water tank (Ref. 38-11-00).

R (4) Remove potable water tank (Ref. 38-12-01).

R (5) Gain access below oven galley rack and cut damaged
R connector at silicon rubber ends.

R (6) Loosen clamps and remove remaining connector pieces.
R Retain clamps for reuse.

R NOTE: Perform Steps 7 through 8 for removal of forward
R connector at exhaust fan in forward cargo
R compartment.

R (7) Remove blow out panel located on left sidewall panel
R between FS689 and FS649 (Ref. 25-51-13).

R (8) Remove damaged connector.

R B. Installation

R (1) Verify that circuit breakers opened in Step 3A(1) are
R open and tagged.

R NOTE: To assist installation of connector fold back
R silicone rubber ends before installation.

R (2) Place clamps at each end of connecting duct and place
R connector in position.

R (3) Fold silicon rubber ends back over connecting exhaust
R duct and secure with band clamps.

R (4) Install potable water tank (if removed).

R (5) Fill and sterilize potable water tank (Ref. 38-11-00
R and Ref. 12-15-01).

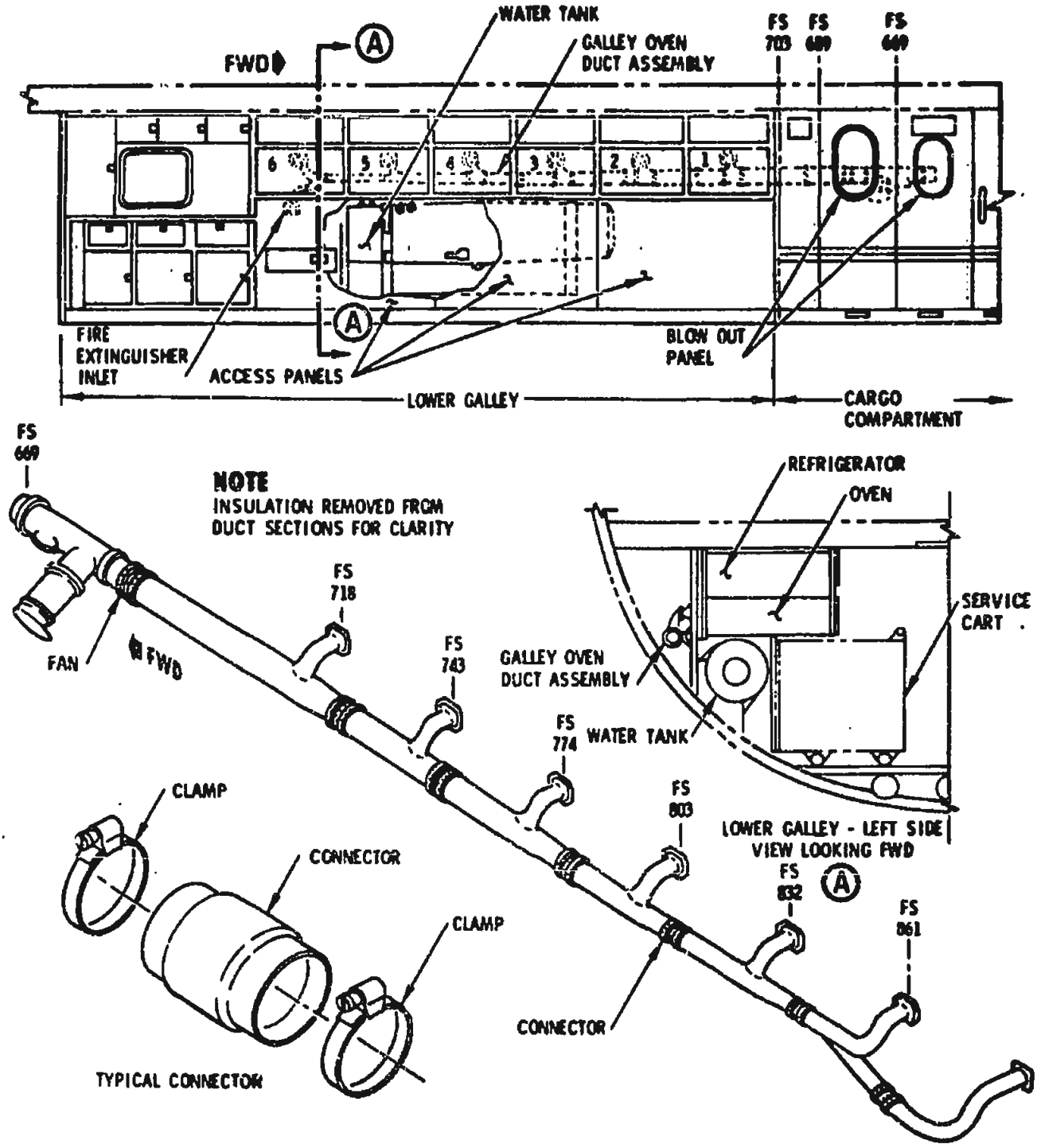
R (6) Install access panels, removed in Step 3A(2).

R NOTE: Perform Steps 7 through 8 if forward connector
R at exhaust fan in forward cargo compartment was
R removed.

R (7) Install connector.

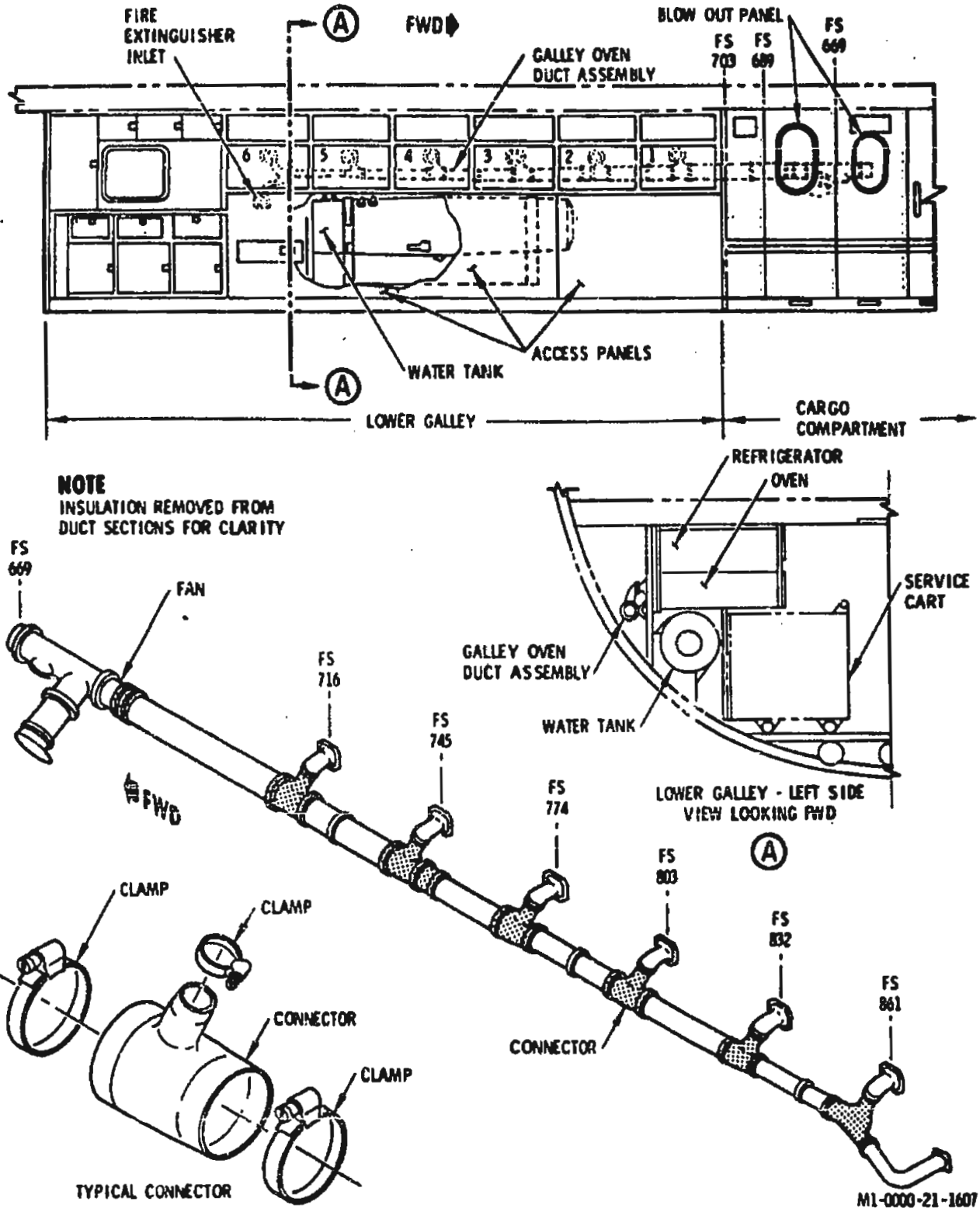
R (8) Install blow out panel.

R (9) Remove tags and close circuit breakers opened in Step
R 3A(1).



M1-0000-21-1608

R Galley Oven Exhaust Duct High Temp Air Connectors - Removal and
R Installation
R Figure 401



R Galley Oven Exhaust Duct High Temp Air Connectors - Removal and
R Installation
R Figure 401

R EFFECTIVITY: 007-999

GALLEY CARBON DIOXIDE VENT SYSTEM - CLEANING AND PAINTING

1. General

The galley carbon dioxide vent system is driven by the MESC exhaust air system fan to draw air and carbon dioxide vapor from the galley floor area. Air and vapor from dry-ice refrigerated service carts are taken through two screened openings in the left side of the galley floor, one below the galley sink and one opposite and just forward of the galley door (Ref. Fig. 701).

To avoid ingestion of cleaning materials or small parts into the vent system, the MESC exhaust fan is disabled during this cleaning procedure.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Vacuum cleaner with hose and crevice tool

Cleaning solution, Air Tech No. 10, Turco Products Co., or equivalent

Cleaning rags

4. Cleaning/Painting

A. Inlet Duct Opening/Screen Cleaning

R (1) Placard flight station to limit Mid Electrical Service Center (MESC) equipment operation while MESC exhaust fan is inoperative.

R (2) On galley left circuit breaker panel, zone 131, open and tag circuit breaker

R FAN - AVIONICS - RACK - MAIN (14D).

R (3) Vacuum floor around forward and aft screened inlet openings (Ref. Fig. 701) and remove screws to remove screened covers.

R (4) Use crevice tool to vacuum inlet ducts below openings in floor.

R (5) Clean accessible ducting below openings with cleaning rag damp with cleaning solution, then wipe duct dry with dry cleaning rag.

R (6) Wash screened covers in cleaning solution and wipe dry.

R (7) Install screened covers on duct openings in floor.

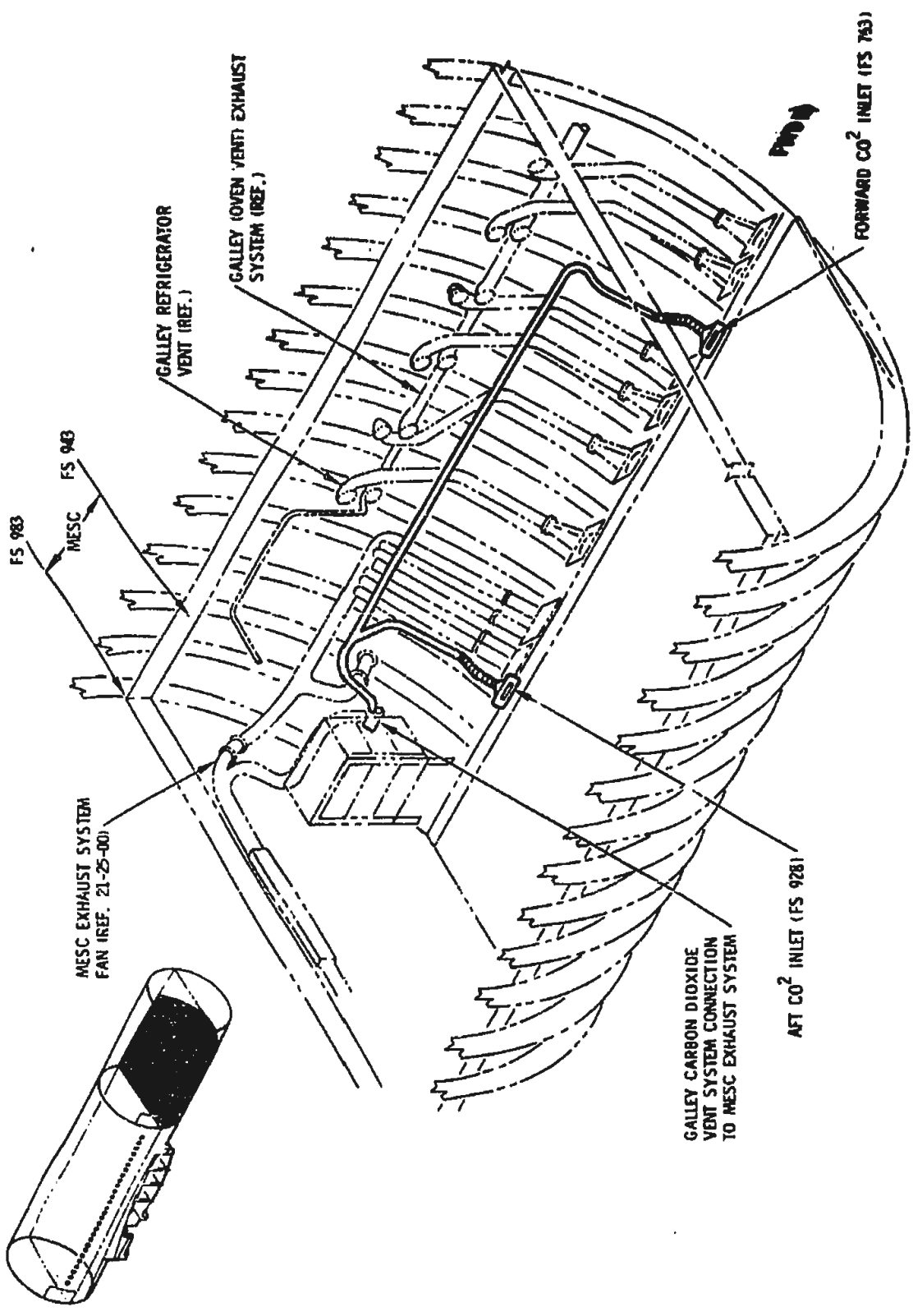
R (8) Remove tag and close circuit breaker opened in Step 4A(2).

R (9) Turn on electrical power (Ref. 24-00-00).

R (10) Verify vent system operation by feeling air flow into each inlet opening.

R (11) Remove placard installed in Step 4A(1).

R (12) Turn off electrical power (Ref. 24-00-00).


GALLEY REFRIGERATOR VENT (REF.)
GALLEY (OVEN VENT) EXHAUST SYSTEM (REF.)
FORWARD CO^2 INLET (FS 783)
FS 948
MESC
FS 983
MESC EXHAUST SYSTEM FAN (REF. 21-25-00)
AFT CO^2 INLET (FS 928)
GALLEY CARBON DIOXIDE VENT SYSTEM CONNECTION TO MESC EXHAUST SYSTEM

R Galley Carbon Dioxide Vent System
R Figure 701

ELECTRONIC AND ELECTRICAL EQUIPMENT COOLING SYSTEMS DESCRIPTION AND OPERATION

1. General

Many of the electronic and electrical components are temperature sensitive and require air cooling to prevent overheating. Each area with a large number of electrical or electronic components
R has its own cooling system. The areas cooled include the
R Forward Electronic Service Center (FESC), Inertial Navigation
R System (INS), flight station instruments, Mid Electrical Service
R Center (MESC), and the aircraft battery.

2. Forward Electronic Service Center (FESC) Cooling System

The FESC cooling system (Ref. Fig. 1 and 2) includes an exhaust
R fan, fan differential pressure switch, air flow sensor, exhaust flow control valve, exhaust duct check valve, and interconnecting ducting.

R The exhaust fan draws cooling (compartment) air across the
R electronic and electrical equipment and into ducting connected
R to the racks. The equipment racks cooled include the forward,
R mid, and aft avionics racks and the forward electrical rack.
R The fan also draws air through the Indicator Lights Control Box
R (ILCB) and from behind the Flight Engineer/Second Officer
R (FE/SO) overhead circuit breaker panel CB2. The fan is on
R whenever full service electrical power is on the aircraft.

R Whenever the aircraft is on the ground, the air/ground sensing
R system causes the air to be exhausted overboard through the exhaust flow control valve in the forward, lower right side of the fuselage. In flight, the air is normally exhausted below
R the forward cargo compartment floor and is dumped overboard
R through the forward outflow valve (Ref. 21-31-00). Upon
R landing, the exhaust flow control valve opens and illuminates
R the OVBD light in the AVIONIC AIR - FWD indicator. The
R indicator is located on the FE/SO ECS MONITOR panel.

R In flight, fan failure is sensed by a differential pressure
R switch which opens the exhaust flow control valve and
R illuminates the OVBD light. With the exhaust valve open, cooling airflow is maintained by cabin differential pressure.

In the event a pressurization control problem develops, the exhaust flow control valve may be closed by releasing the COOL AIR OVBD switchlight on the FE/SO ECS MONITOR panel.

R The air flow sensor detects duct blockage, fan failure on the ground, or fan failure and failure of the exhaust flow control R valve to open in flight. Insufficient airflow detected by the R flow sensor illuminates the LO FLO light in the AVIONIC AIR - R FWD indicator. The ECS annunciator on the pilots caution and R warning panel illuminates also.

R 3. Inertial Navigation System (INS) Cooling System (Aircraft R 032-999)

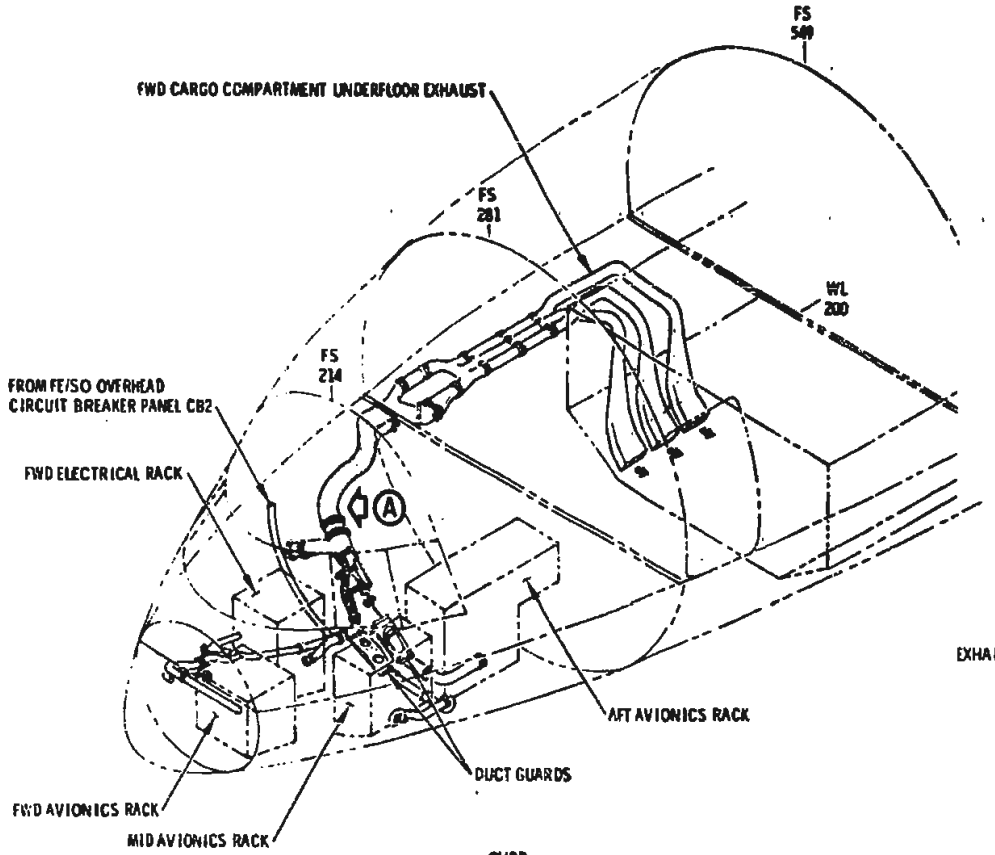
The INS cooling system (Ref. Fig. 3) connects with the FESC R cooling system, but operates independently. It provides additional or standby cooling for the INS equipment normally cooled by the FESC cooling system. The system includes its own R exhaust fan, air flow sensor and check valve located in the ducting adjacent to the forward electrical rack. There is also a temperature control switch mounted on the second shelf of the forward avionics rack.

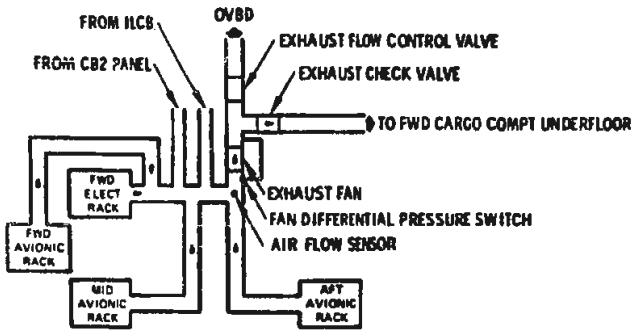
The INS cooling system (Ref. Fig. 4) has two modes of operation, a manual mode and an automatic mode. When the INS COOLING switchlight on the Flight Engineer/Second Officer (FE/SO) ECS MONITOR panel is depressed, the INS cooling exhaust fan is R operating and the ON light in the INS COOLING switchlight is illuminated. When the INS COOLING switchlight is released, the automatic mode of operation is armed.

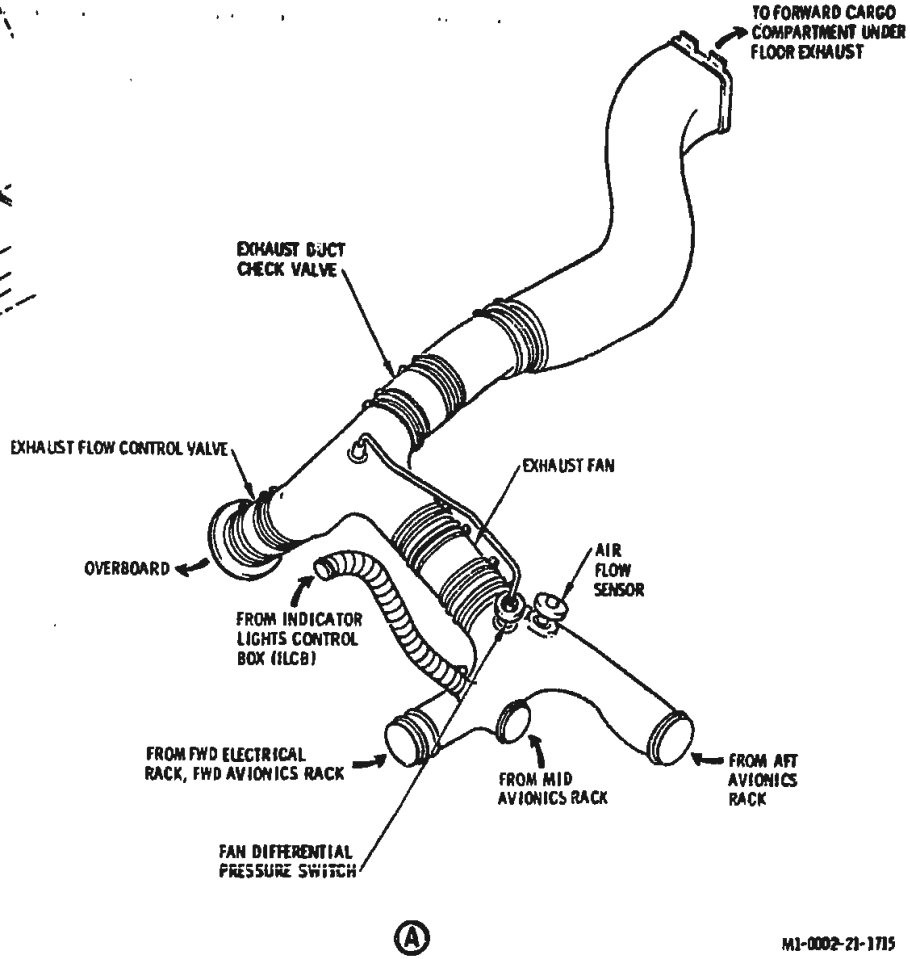
R If airflow becomes insufficient for proper cooling, the flow R sensor closes an internal switch and energizes the INS cooling R latch relay and the INS fan relay. The LO FLO light in the INS R COOLING switchlight illuminates also. With the INS fan relay energized, power is supplied through its normally open contacts R to turn on the fan and illuminate the ON light in the INS COOLING switchlight. With the INS cooling latch relay energized, power is supplied through the normally open contacts to form a holding circuit.

R As airflow increases, the flow sensor switch opens and the LO R FLO light in the INS COOLING switchlight goes off. The ON light remains illuminated and the fan continues to operate due to the holding circuit formed by the INS cooling latch relay. To reset the system, power must be removed from the INS cooling latch relay by cycling the INS COOLING switchlight.

If the INS temperature control switch senses an excessive R temperature, the switch closes and the INS fan relay energizes. R This turns on the fan and illuminates the ON light in the INS COOLING switchlight. When the temperature at the switch cools R below its close setting, the switch opens and the relay R deenergizes. This turns off the fan and the ON light in the

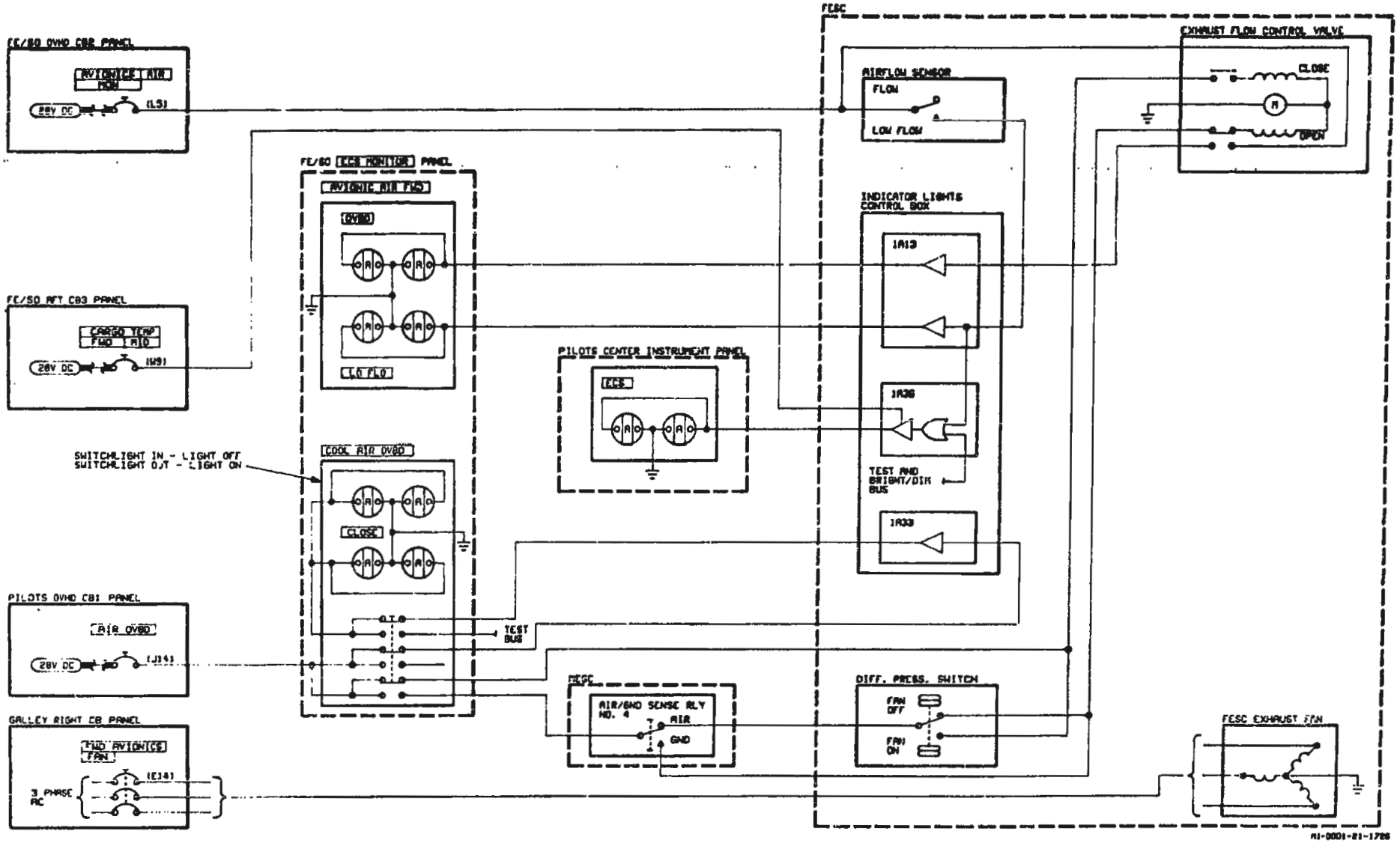






R Forward Electronic Service Center Cooling System
R Figure 1

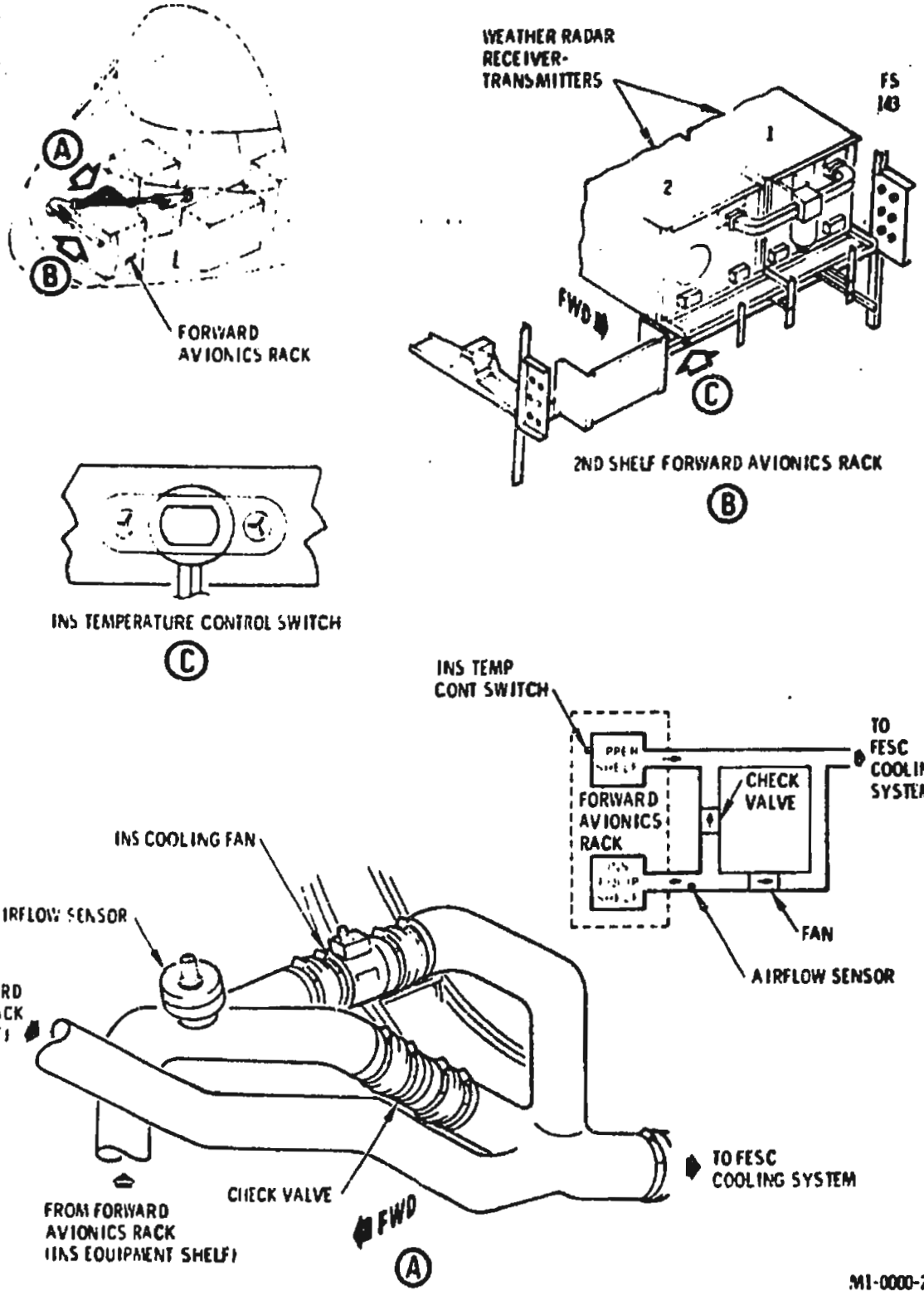
R EFFECTIVITY: ALL
R
001B



R Simplified Schematic
R Forward Electronic Service Center Cooling System
R Figure 2

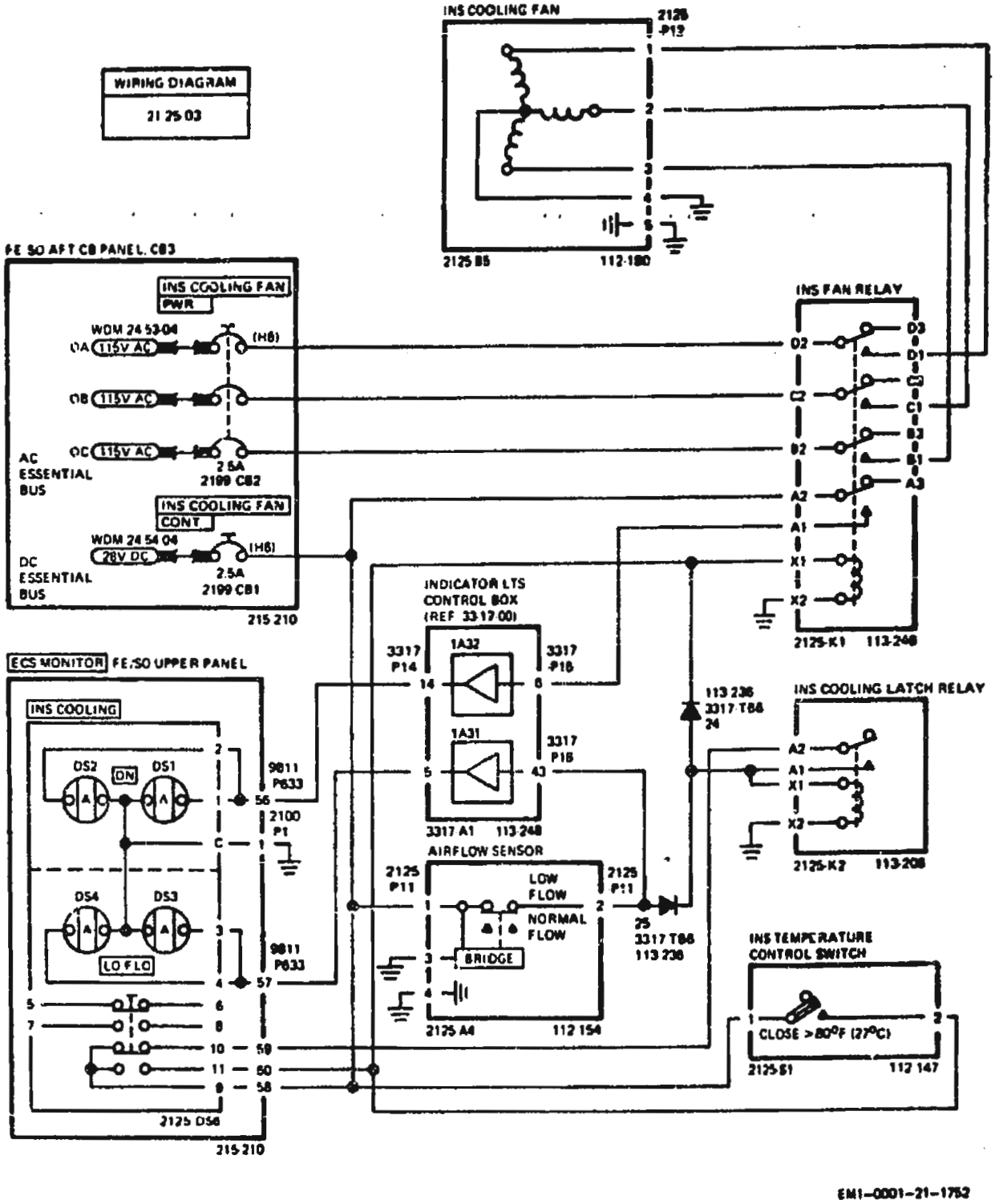
EFFECTIVITY: ALL

0018



R
R

INS Cooling System
Figure 3



Schematic - INS Cooling System
Figure 4

EFFECTIVITY: 032-999

R switchlight goes off. The switch is set to close at temperatures above 80°F (27°C).

4. Flight Station Instrument Cooling System

The flight station instrument cooling system (Ref. Fig. 5 and 6) consists of a fan and ducting to direct cooling air across the back of the Flight Engineer/Second Officer (FE/SO) and Pilots instrument panels and instruments. The instrument cooling fan is on whenever full service electrical power is on the aircraft.

The instrument cooling fan draws air from the flight station through a grille in the FE/SO kickpanel below the work table.

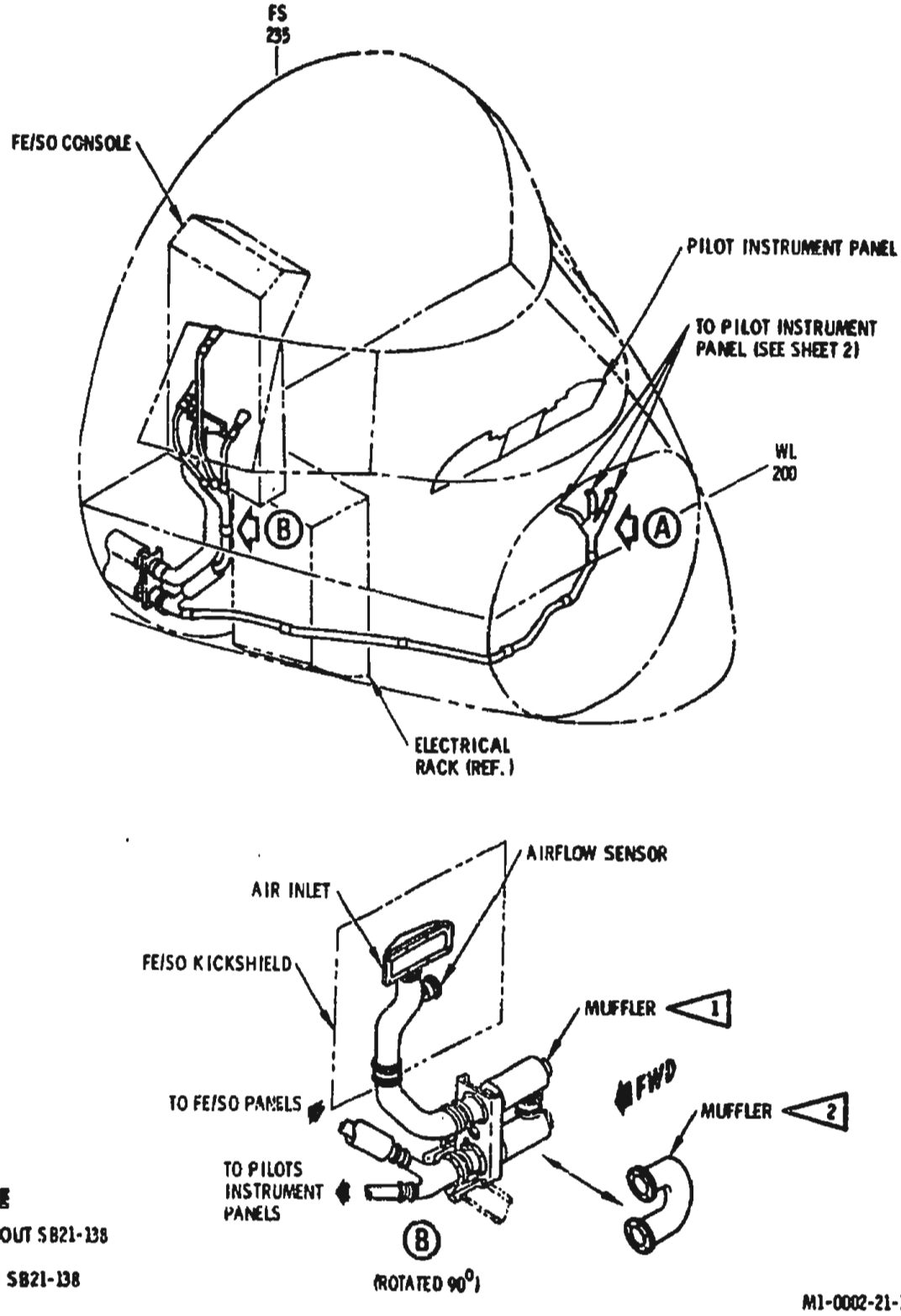
On aircraft 001-031 with SB21-123,
there is an air flow sensor to monitor proper airflow in the system. If the fan fails, the air flow sensor illuminates the PILOT INSTR COOL FAN light on the FE/SO annunciator panel.

NOTE: SB21-123 requires prior incorporation of SB21-050 in aircraft 001-020.

On aircraft 001-031 with SB21-143,
the instrument cooling fan draws air from the aft cabin air supply duct in the FESC, just forward of the cold air plenum. The instrument cooling air outlet is upstream of the zone trim air inlet to prevent uncontrolled hot air from entering the instrument cooling supply duct. There is no indication of fan failure in the flight station.

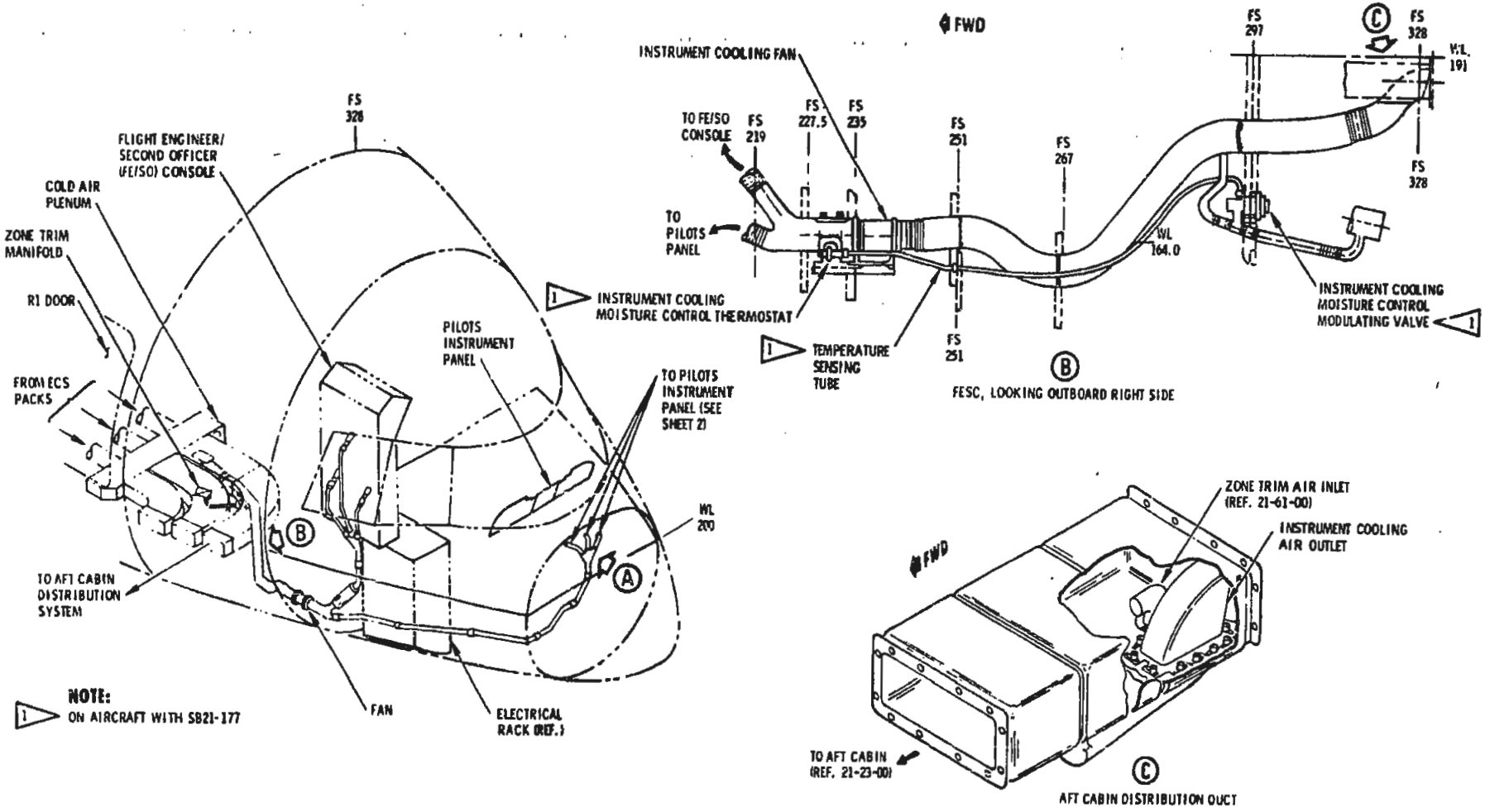
NOTE: SB21-143 is an alternative to SB21-050.

On aircraft 032-999,
the instrument cooling fan draws air from the aft cabin air supply duct in the FESC, just forward of the cold air plenum. The instrument cooling air outlet is upstream of the zone trim air inlet to prevent uncontrolled hot air from entering the instrument cooling supply duct. There is a diverter valve installed in the instrument cooling duct to provide an alternate air source. Under normal conditions, the temperature in the cold air plenum is low and provides the normal source of cooling air. During cold weather ground operations, hot ground air may be added to warm the aircraft. If the temperature in the aft cabin supply duct exceeds 110°-120°F (43°-49°C), the instrument ground cooling temperature switch closes. This causes the diverter valve to block off the normal supply and draw air from the FESC instead. The PILOT INSTR COOL SYS light on the FE/SO annunciator panel illuminates if either the fan fails or the diverter valve opens to the FESC. Fan failure is sensed by a differential pressure switch.



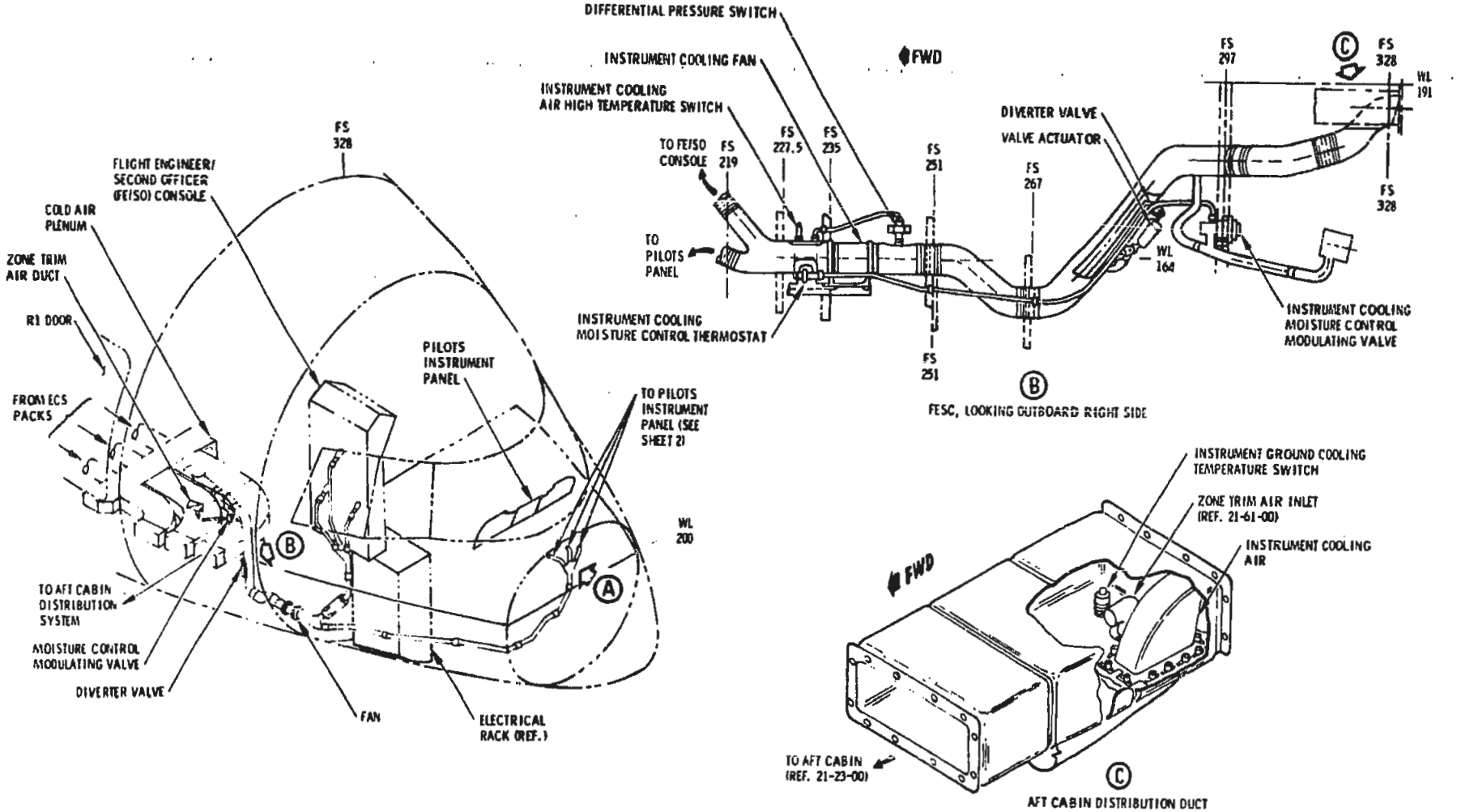
R Flight Station Instrument Cooling System
R Figure 5 (Sheet 1)

EFFECTIVITY: 001-031 WITHOUT SB21-143



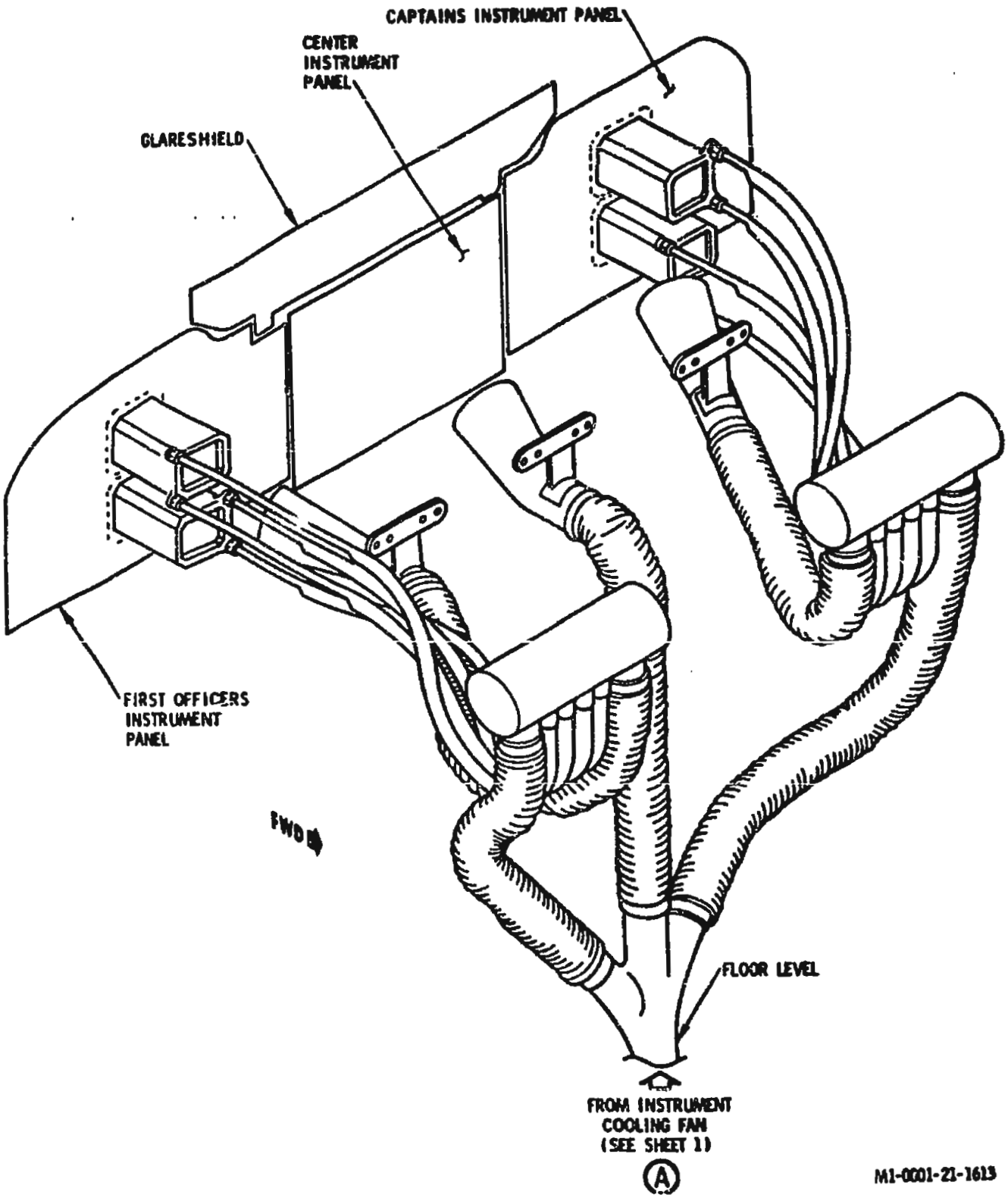
R R Flight Station Instrument Cooling System
Figure 5 (Sheet 1)

R R 0018 EFFECTIVITY: 001-031 WITH SB21-143



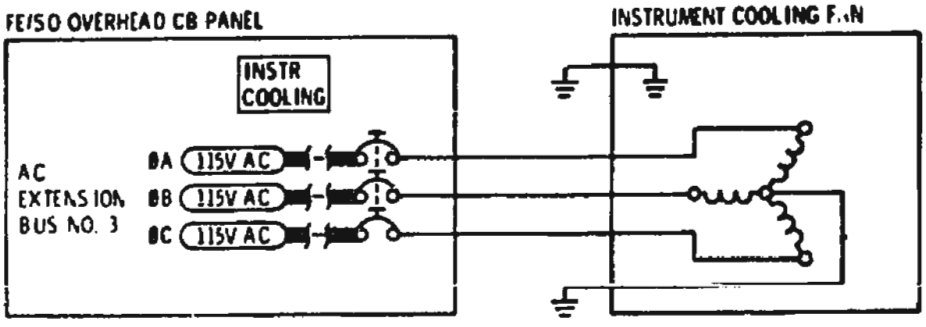
R Flight Station Instrument Cooling System
R Figure 5 (Sheet 1)

R EFFECTIVITY: 032-999
R
0018



R R Flight Station Instrument Cooling System
Figure 5 (Sheet 2)

R R EFFECTIVITY: ALL



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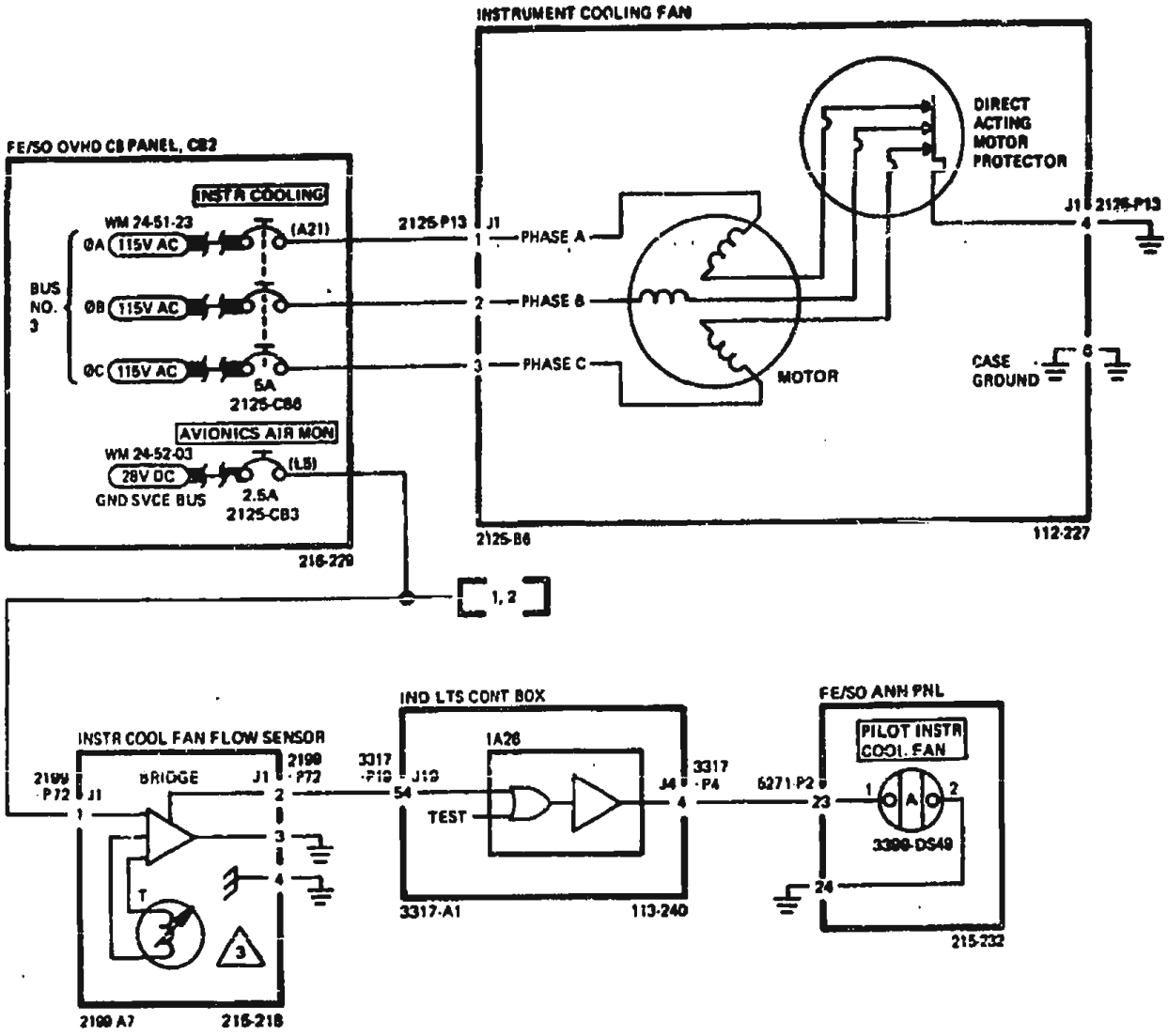
Schematic - Flight Station Instrument Cooling System
Figure 6



NOTE

1 [1] - CROSS REF. TO SCHEM IN SAME ATA NO.

2 [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.

3 IF AIR FLOW CEASES, HEAT IS NOT DISSIPATED IN THERMISTOR AND TEMPERATURE INCREASE. RESISTANCE CHANGES BALANCE IN BRIDGE WHICH SWITCHES TO ALLOW 28V DC TO PIN 2

WM DIA CROSS REF.

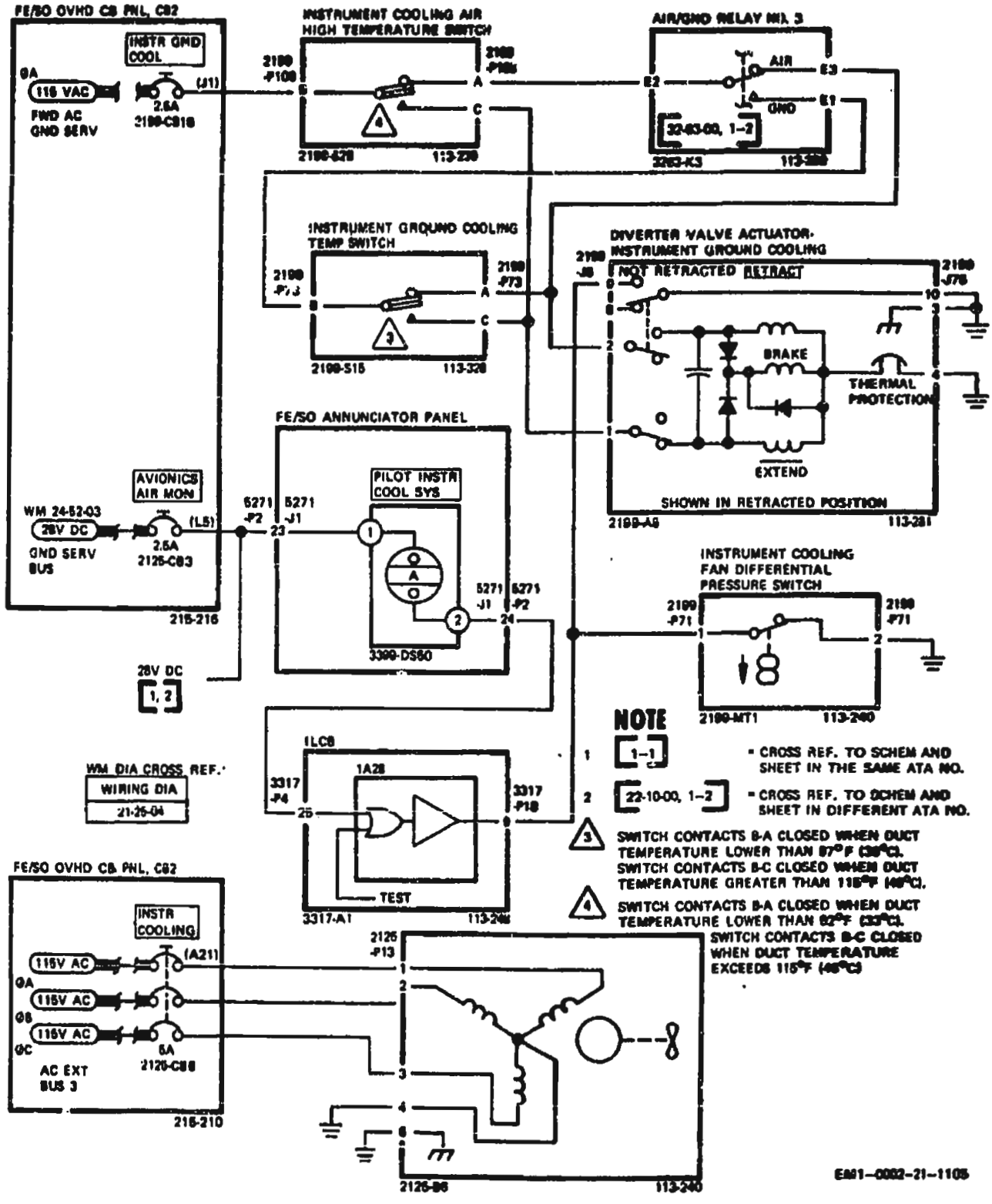
WIRING DIA
21-26-04

EM1-0000-21-6272

R Simplified Schematic - Flight Station Instrument Cooling System
R Figure 6

EFFECTIVITY: 001-031 WITH SB21-123

001B



Schematic - Flight Station Instrument Cooling System
Figure 6

R On aircraft 001-031 with SB21-177, moisture condensation on the instruments is prevented by a moisture control system. The system injects hot air from the zone trim manifold into the instrument cooling air taken from the cold air plenum. A modulating valve, regulated by a thermostat, maintains air temperatures between 65°F and 75°F
R (18°C and 24°C). An instrument cooling air high temperature
R switch is installed in the duct, downstream of where the hot air
R is injected. If either the thermostat or modulating valve
R malfunction, the temperature switch closes when duct temperature
R reaches 110°-120°F (43°-49°C). This closes and locks out both
R hot air isolation valves, cutting off the supply of hot air to
R the zone trim manifold. When the duct temperature cools, the
R temperature switch will reopen. The hot air isolation valves
R can then be reopened by cycling both HOT AIR ISLN VALVE
R switchlights on the FE/SO CABIN TEMP CONTROL panel.

NOTE: SB21-177 requires prior incorporation of SB21-143.

On aircraft 032-999,
R moisture condensation on the instruments is prevented by a
R moisture control system. The system injects hot air from the
R zone trim manifold into the instrument cooling air taken from
R the cold air plenum. A modulating valve, regulated by a
R thermostat, maintains air temperatures between 65°F and 75°F
R (18°C and 24°C). An instrument cooling air temperature switch
R is installed in the duct, downstream of where the hot air is injected. If either the thermostat or modulating valve
R malfunction, the temperature switch closes at 110°-120°F
R (43°-49°C). This causes the diverter valve to block off the supply of warm air and draw cooler air from the FESC.

5. Mid Electrical Service Center (MESC) Cooling System

The MESC cooling system (Ref. Fig. 7) is similar to the FESC cooling system. The system includes an exhaust fan, fan
R differential pressure switch, air flow sensor, exhaust flow control valve, exhaust check valve, and ducting.

The exhaust fan draws cooling (compartment) air across the electronic and electrical equipment on the left and right equipment racks and into the ducting. Air from the underfloor
R area of the MESC is drawn through the underfloor exhaust duct. Air is also drawn in through inlet grilles to exhaust any
R hydrogen gas from the aircraft battery. The fan is on whenever
R full service electrical power is on the aircraft.

Whenever the aircraft is on the ground, the air/ground sensing
R system (Ref. Fig. 8) causes the air to be exhausted overboard through the exhaust flow control valve in the bottom of the left wing leading edge fillet. In flight, the air is normally

R exhausted below the galley floor and is dumped overboard through
R the forward outflow valve (Ref. 21-31-00). Upon landing, the
R exhaust flow control valve opens and illuminates the OVBD light
R in the AVIONIC AIR - MID indicator. The indicator is located on the Flight Engineer/Second Officer (FE/SO) ECS MONITOR panel.

R In flight, fan failure is sensed by a differential pressure
R switch which shuts off the battery charger, opens the exhaust
R flow control valve and illuminates the OVBD light. The BATTERY
R CONDITION indicator light on the FE/SO APU CONTROL panel
R illuminates also. With the exhaust valve open, cooling airflow is maintained by cabin differential pressure.

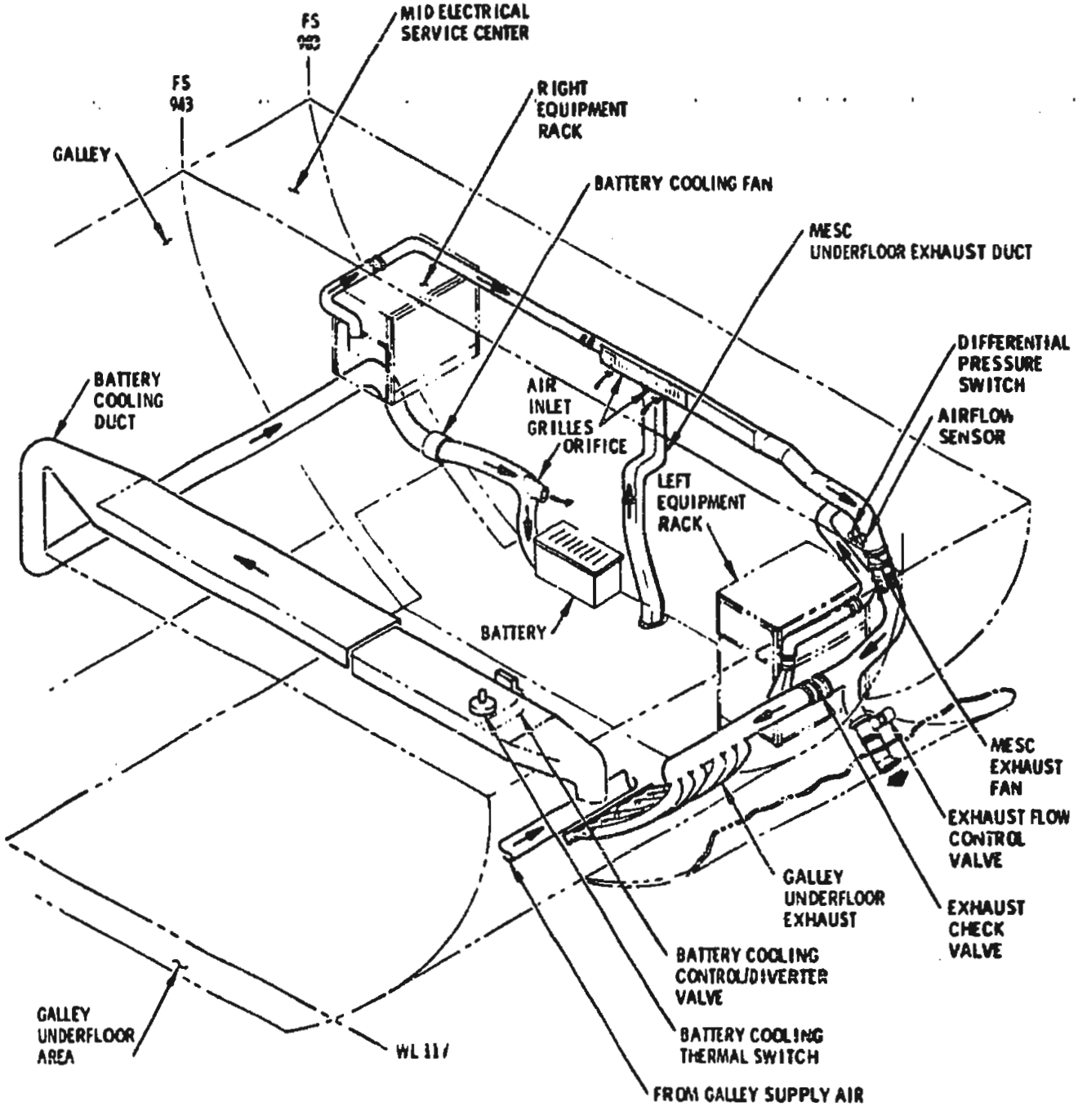
In the event a pressurization control problem develops, the exhaust flow control valve may be closed by releasing the COOL AIR OVBD switchlight on the FE/SO ECS MONITOR panel.

R The air flow sensor detects duct blockage, fan failure on the
R ground, or fan failure and failure of the exhaust flow control
R valve to open in flight. Insufficient airflow detected by the
R flow sensor illuminates the LO FLO light in the AVIONIC AIR -
R MID indicator. The ECS annunciator on the pilots caution and
R warning panel illuminates also.

6. Battery Cooling System

The battery, located in the Mid Electrical Service Center (MESC), is cooled by an independent system (Ref. Fig. 7 and 9) which uses a fan to force air through the battery box. The air enters at the base and discharges through the top into the MESC. An orifice in the ducting is open to provide a fixed amount of air to the battery and must not be blocked. The fan runs
R whenever full service electrical power is on the aircraft and the battery charger circuit breaker on the Flight Engineer/Second Officer aft circuit breaker panel is closed.

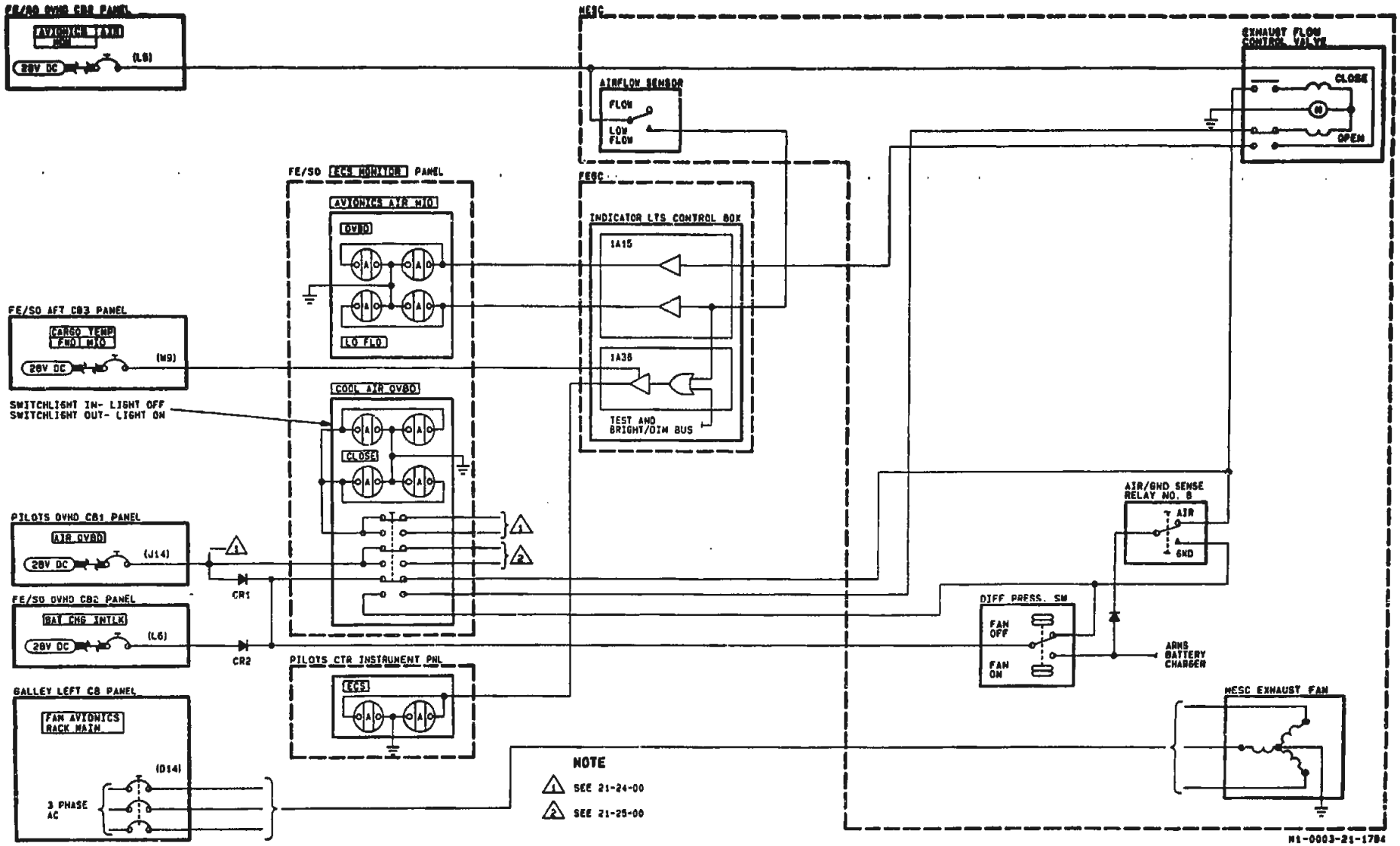
Cooling air is forced through the battery box from the galley supply air duct (Ref. Fig. 7). If the galley supply air is
R warmer than 90°F (32°C), the battery cooling thermal switch
R closes. This energizes the actuator of a diverter valve which blocks off air from the galley supply air duct and draws air directly from the galley instead.



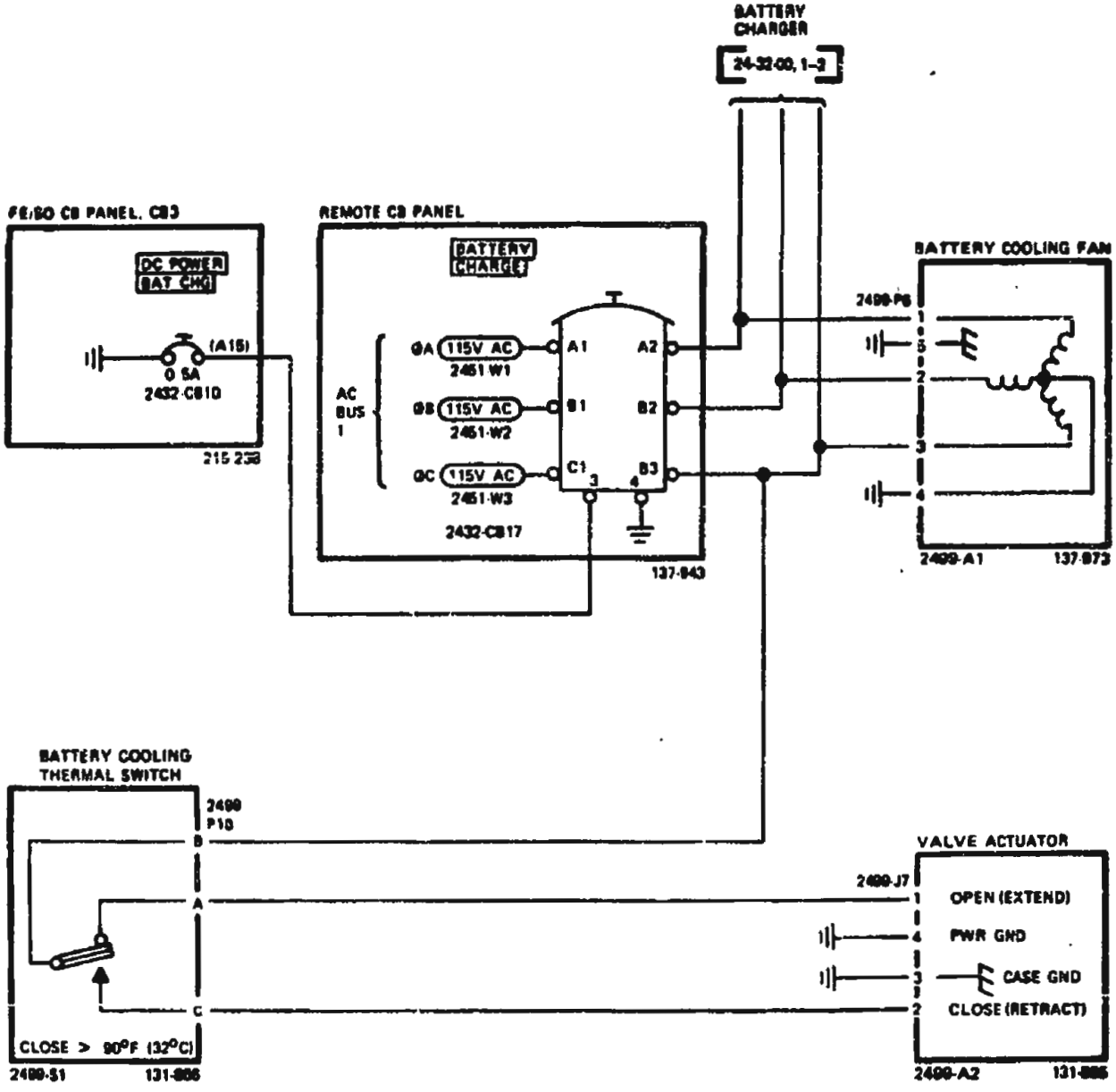
M1-0001-21-1767

R Mid Electrical Service Center Cooling System
R and Battery Cooling System
R Figure 7

R EFFECTIVITY: ALL
R
0018



R Simplified Schematic
R Mid Electrical Service Center Cooling System
R Figure 8



WIRING DIA
24-32-03

NOTE

1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.

2 [22-10-00, 1-2] - CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.

EM1-0003-21-002

Schematic - Battery Cooling System
Figure 9

R # ELECTRONIC AND ELECTRICAL EQUIPMENT COOLING SYSTEMS FAULT ISOLATION

1. General

Reference data and fault isolation procedures for
R troubleshooting Electronic and Electrical Equipment Cooling
R System faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

Figure 101, Component Location Index, is an alphabetical listing
R of all components associated with the Electronic and Electrical
R Equipment Cooling System. It gives the area and access of each
R component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Fault Isolation/Identification

Table 101 is a list of all fault isolation data in this section of the manual

TABLE 101

	FIGURE	TITLE
	101	Component Location Index (Sheet 1) FESC Cooling System (Sheet 2) INS Cooling System (Sheet 3) Instrument Cooling System (Sheet 4) MESC Cooling System (Sheet 5) Battery Cooling System
	102	Component Locator Diagram
R		(Sheet 1) Miscellaneous Components
R		(Sheet 2) FESC Cooling System
R		(Sheet 3) INS Cooling System
R		(Sheet 4) Instrument Cooling System
R		(Sheet 5) MESC Cooling System
R		(Sheet 6) Battery Cooling System
	103	FWD AVIONIC AIR Cooling Problem
	104	MID AVIONIC AIR Cooling Problem
	105	INS Cooling Problem
	SCHEM 1	Forward Electronic Service Center (FESC) Cooling System Schematic
	SCHEM 2	Mid Electrical Service Center (MESC) Cooling System Schematic
	SCHEM 3	Instrument Cooling System Schematic
	SCHEM 4	Battery Cooling System Schematic
	SCHEM 5	INS Cooling System Schematic

COMPONENT	QTY	102 SHT	AREA/ACCESS	REFERENCE
ACTUATOR – FESC EXHAUST FLOW CONTROL VALVE	1	2	FESC, RIGHT AFT/112AB	21-26-30
CHECK VALVE – FESC EXHAUST DUCT	1	2	FESC, RIGHT AFT/112AB	21-26-07
CIRCUIT BREAKERS:				
AIR OVBD 2120-CB1	1	1	FLT STA/CB1 PANEL (J14)	*
AVIONICS – AIR – MON 2125-CB3	1	1	FLT STA/CB2 PANEL (L5)	*
CARGO TEMP – FWD – MID 2144-CB5	1	1	FLT STA/CB3 PANEL (W9)	*
FWD AVIONICS – FAN 2125-CB2	1	1	GALLEY/RT CB PANEL (E14)	*
DIODE 2125-CR1	1	1	FE/SO UPPER PANEL P11, BEHIND ECS MONITOR PNL	*
FAN – FESC EXHAUST	1	2	FESC, RIGHT AFT/112AB	21-25-03
INDICATOR LIGHT – AVIONIC AIR FWD 2125-DS1	1	1	FE/SO ECS MONITOR PNL, P11	*
INDICATOR LIGHTS CONTROL BOX:				
ILCB CARD 1A13	1	2	FESC, RIGHT AFT/112AB	33-17-04
ILCB CARD 1A33	1	2	FESC, RIGHT AFT/112AB	33-17-04
ILCB CARD 1A36	1	2	FESC, RIGHT AFT/112AB	33-17-04
RELAYS:				
GND SENSING 3263-K4	1	2	FESC, RIGHT AFT, NOSE GEAR LIGHTS AND SENSING PANEL/112AB	20-24-01
SENSOR – FESC EXHAUST AIR FLOW	1	2	FESC, RIGHT AFT/112AB	21-25-01
SWITCH – FESC EXHAUST FAN DIFFERENTIAL PRESSURE	1	2	FESC, RIGHT AFT, INBD OF EXHAUST FAN	21-25-05
SWITCHLIGHT:				
COOL AIR OVBD 2120-DS1	1	1	FE/SO ECS MONITOR PNL, P11	20-33-01
VALVE – FESC EXHAUST FLOW CONTROL	1	2	FESC, RIGHT AFT/112AB	21-25-09

*SEE WM EQUIPMENT LIST

MI-0003-21-1371

R Component Location Index
R FESC Cooling System
R Figure 101 (Sheet 1)

EFFECTIVITY: ALL

001B

COMPONENT	QTY	102 SHT	AREA/ACCESS	REFERENCE
CAPACITOR 2125-A3 (1)	1	3	FESC, RIGHT AFT, BEHIND PANEL FS251-FS266/112AB	•
CHECK VALVE – INS COOLING (1)	2	3	FESC, RIGHT FWD/112AB	21–25–16
CHECK VALVE – INS COOLING (2)	1	3	FESC, RIGHT FWD/112AB	21–25–16
CIRCUIT BREAKERS:				
INS – CONT 3043-CB1 (1)	1	1	FLT STA/CB2 (C19)	•
INS COOLING FAN – CONT 2199-CB1 (2)	1	1	FLT STA/CB3 (H6)	•
INS COOLING FAN – PWR 2199-CB2 (2)	1	1	FLT STA/CB3 (H8)	•
INS – FAN 3043-CB2 (1)	1	1	FLT STA/CB2 (C21)	•
DIODES:				
TERMINAL MODULE 3317-TB6-24	1	3	FESC, RIGHT AFT, TOP RAIL ON PANEL FS251-FS266/112AB	•
TERMINAL MODULE 3317-TB6-25	1	3	FESC, RIGHT AFT, TOP RAIL ON PANEL FS251-FS266/112AB	•
FAN – INS COOLING	1	3	FESC, RIGHT FWD/F112AB	21–25–17
INDICATOR LIGHTS CONTROL BOX:				
ILCB CARD IA31	1	3	FESC, RIGHT AFT/112AB	33–17–04
ILCB CARD IA32	1	3	FESC, RIGHT AFT/112AB	33–17–04
RELAYS:				
INS FAN 2125-K1	1	3	FESC, RELAY PNL AFT OF ILCB/ 112AB	20–24–01
INS COOLING LATCH 2125-K2 (2)	1	3	FESC, RELAY PNL AFT OF ILCB/ 112AB	20–24–01
SENSOR – INS COOLING AIR FLOW	1	3	FESC, RIGHT FWD/112AB	21–25–15
SWITCH – INS TEMPERATURE CONTROL (2)	1	3	FESC, BEHIND 2ND SHELF FWD AVIONIC RACK/112AB	21–25–18
SWITCHLIGHT – INS COOLING	1	1	FE/SO ECS MONITOR PNL, P11	20–33–01

NOTE

(1) ON AIRCRAFT 018-031

(2) ON AIRCRAFT 032-999

*SEE WM EQUIPMENT LIST

M1–0004–21–1378

CR Component Location Index
CR INS Cooling System
CR Figure 101 (Sheet 2)

EFFECTIVITY: 025, 026, 028-999

001B

COMPONENT	QTY	102 SHT	AREA/ACCESS	REFERENCE
ACTUATOR – DIVERTER VALVE 3	1	4	FESC, RIGHT AFT/112AB	21-26-34
CIRCUIT BREAKERS:				
AVIONICS – AIR – MON 2125-CB3 1 3	1	1	FLT STA/CB2 (L5)	•
INSTR – COOLING 2125-CB5	1	1	FLT STA/CB2 (A21)	•
INSTR – GND – COOL 2199-CB16 3	1	1	FLT STA/CB2 (J1)	•
FAN – INSTRUMENT COOLING	1	4	FESC, RIGHT FWD/112AB	21-26-21
INDICATOR LIGHTS:				
PILOT INSTR COOL FAN 3399-DS49 1	1	4	FE/SO ANNUNCIATOR PNL	20-33-04
PILOT INSTR COOL SYS 3399-DS50 3	1	--	FE/SO ANNUNCIATOR PNL	20-33-04
INDICATOR LIGHT CONTROL BOX:				
ILCB CARD 1A26 1	1	4	FESC, RIGHT AFT/112AB	33-17-04
ILCB CARD 1A28 3	1	4	FESC, RIGHT AFT/112AB	33-17-04
RELAY – GND SENSING 3263-K3 3	1	2	FESC, RIGHT AFT, NOSE GEAR LIGHTS AND SENSING PANEL/ 112AB	20-24-01
SENSOR – INSTRUMENT COOLING AIR FLOW 1	1	4	FLT STA/ON DUCT BEHIND FE/SO KICKPANEL	21-26-32
SWITCH – INSTRUMENT COOLING DIFFERENTIAL PRESSURE 3	1	4	FESC, RIGHT AFT/112AB	21-26-35
SWITCH – INSTRUMENT COOLING AIR HIGH TEMPERATURE 3	1	4	FESC, RIGHT AFT/112AB	21-26-41
SWITCH - INSTRUMENT GROUND COOLING TEMPERATURE 3	1	4	FESC, RIGHT AFT, AFT CABIN SUPPLY AIR DUCT/112AB	21-25-36
THERMOSTAT – INSTRUMENT COOLING MOISTURE CONTROL 2 3	1	4	FESC, RIGHT AFT/112AB	21-25-39
VALVE – INSTRUMENT COOLING MOISTURE CONTROL MODULATING 2 3	1	4	FESC, RIGHT AFT/112AB	21-25-40

NOTE

1 ON AIRCRAFT 001-031 WITH S821-123

2 ON AIRCRAFT 001-031 WITH S821-177 (S821-177 REQUIRES PRIOR INCORP OF S821-143)

3 ON AIRCRAFT 032-999

*SEE WM EQUIPMENT LIST

M1 0003-21-1372

R Component Location Index
R Instrument Cooling System
R Figure 101 (Sheet 3)

EFFECTIVITY: ALL

0018

COMPONENT	QTY	102 SHT	AREA/ACCESS	REFERENCE
ACTUATOR - MESC EXHAUST FLOW CONTROL VALVE	1	5	BEHIND LEFT WING LEADING EDGE FILLET/191F	21-25-31
CHECK VALVE - MESC EXHAUST DUCT	1	5	MESC, UPPER LEFT, BEHIND LEFT ELECT RACK/192K	21-25-08
CIRCUIT BREAKERS:				
AIR OVBD 2120 CB1	1	1	FLT STA/CB1 PANEL (J14)	•
AVIONICS - AIR - MON 2125 CB3	1	1	FLT STA/CB2 PANEL (L5)	•
BAT - CHG - INTLK 2125 CB5	1	1	FLT STA/CB2 PANEL (L6)	•
CARGO TEMP - FWD - MID 2144 CB5	1	1	FLT STA/CB3 PANEL (W9)	•
FAN - AVIONICS RACK - MAIN 2125 CB4	1	1	GALLEY/LH CB PANEL (140)	•
DIODES:				
2125 CR1	1	1	FE/SO UPPER PNL, P11 BEHIND ECS MONITOR PNL	•
2125 CR2	1	1	FE/SO UPPER PNL, P11 BEHIND ECS MONITOR PNL	•
2125 CR3	1	1	MESC/AFT BLKHD, INSIDE BATTERY RELAY BOX/192K	•
FAN - MESC EXHAUST	1	5	MESC, LEFT SIDE/192K	21-25-04
INDICATOR LIGHT AVIONIC AIR MID 2125 DS2	1	1	FE/SO ECS MONITOR PNL, P11	•
INDICATOR LIGHTS CONTROL BOX				
ILCB CARD 1A15	1	2	FESC, RIGHT AFT/112AB	33-17-04
ILCB CARD 1A36	1	2	FESC, RIGHT AFT/112AB	33-17-04
RELAY - AIR/GND SENSE NO. 8 3263 K8	1	5	MESC, FWD BLKHD RELAY PANEL/192K	20-24-01
SENSOR - MESC EXHAUST AIR FLOW	1	5	MESC, LEFT SIDE, ABOVE EXHAUST FAN/192K	21-25-02
SWITCH - MESC EXHAUST FAN DIFFERENTIAL PRESSURE	1	5	MESC, LEFT SIDE, ABOVE EXHAUST FAN/192K	21-25-06
SWITCHLIGHT - COOL AIR OVBD 2120 DS1	1	1	FE/SO ECS MONITOR PNL, P11	20-33-01
VALVE MESC EXHAUST FLOW CONTROL	1	5	BEHIND LEFT WING LEADING EDGE FILLET/191F	21-25-10

*SEE WM EQUIPMENT LIST

M1-0003-21-1618

R Component Location Index
R MESC Cooling System
R Figure 101 (Sheet 4)

EFFECTIVITY: ALL

0018

COMPONENT	QTY	102 SHT	AREA/ACCESS	REFERENCE
ACTUATOR – BATTERY COOLING AIR CONTROL/DIVERTER VALVE	1	6	GALLEY CEILING/136HL, 136JL	21-26-33
CIRCUIT BREAKER: BAT CHG 2432-CB10	1	1	FLT STA/CB3 PANEL (A16)	*
FAN – BATTERY COOLING	1	6	MESC. AFT BLKHD, NEAR BATTERY	21-26-24
SWITCH – BATTERY COOLING THERMAL 2499-S1	1	6	GALLEY CEILING/135HL, 135JL	21-26-26

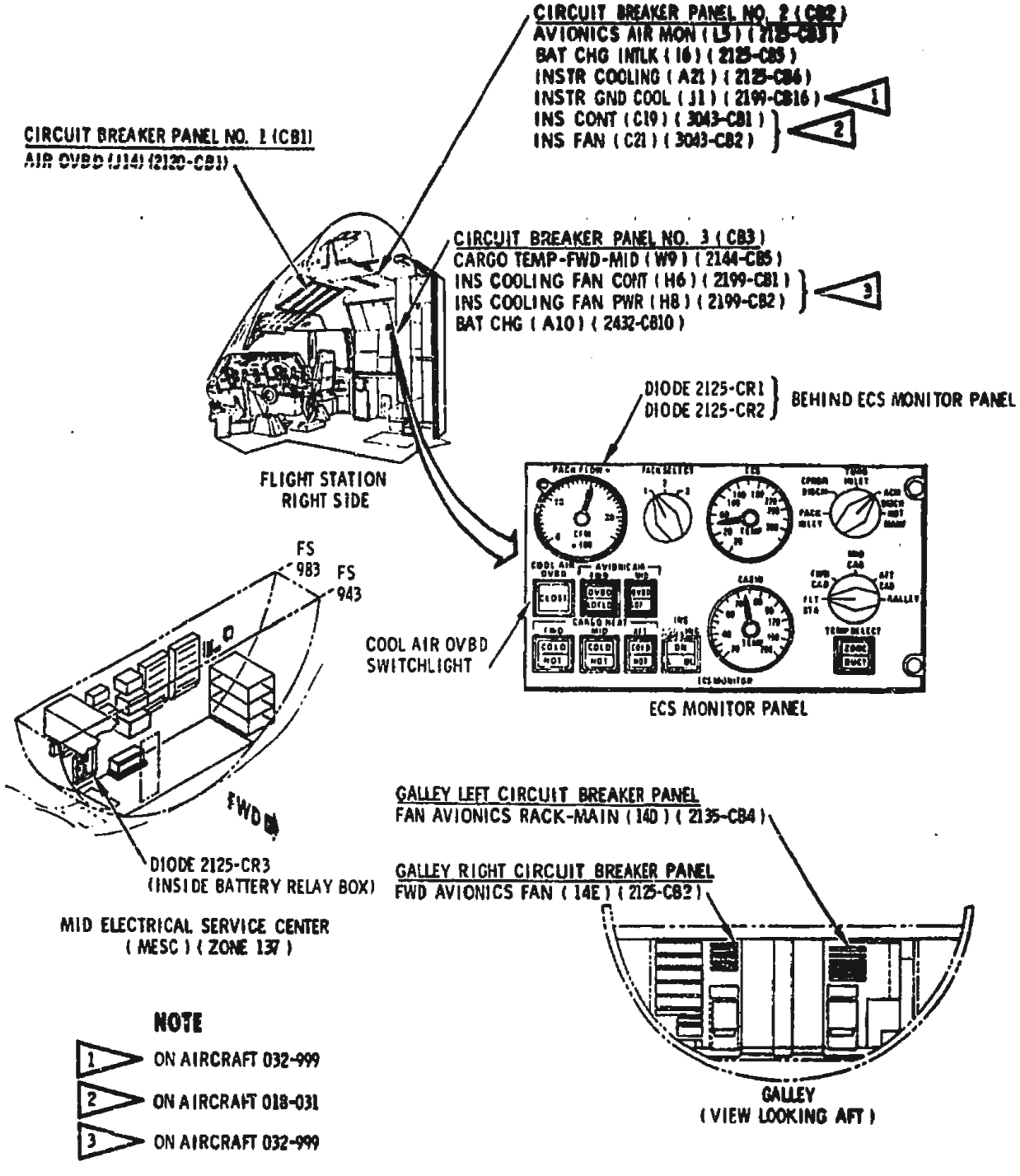
*SEE WM EQUIPMENT LIST

M1-0004-21-1468

R Component Location Index
R Battery Cooling System
R Figure 101 (Sheet 5)

EFFECTIVITY: ALL

001B



NOTE

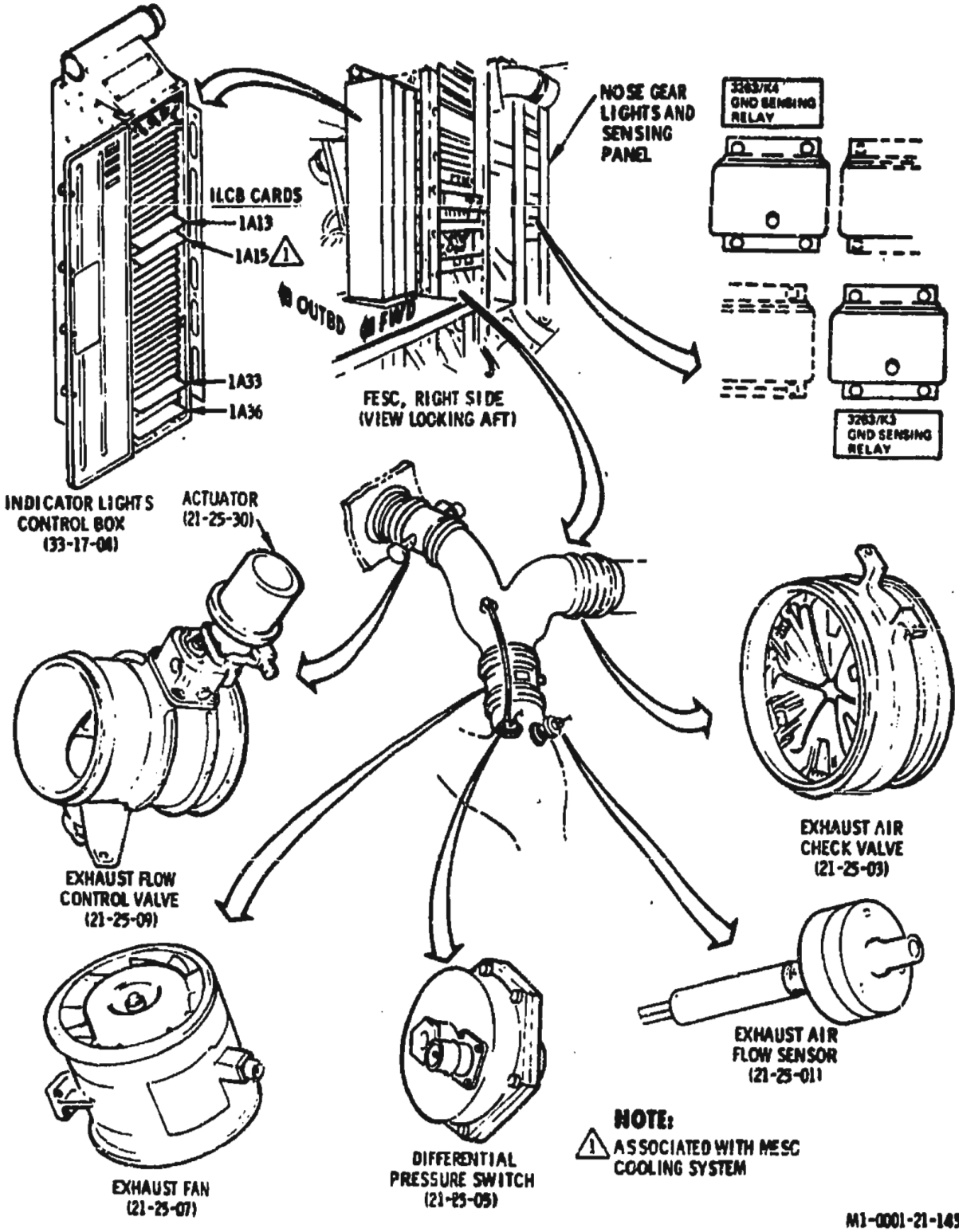
1. ON AIRCRAFT 032-999
2. ON AIRCRAFT 018-031
3. ON AIRCRAFT 032-999

M1-0002-21-1386

CR Component Locator Diagram
CR Miscellaneous Components
CR Figure 102 (Sheet 1)

EFFECTIVITY: ALL

001B

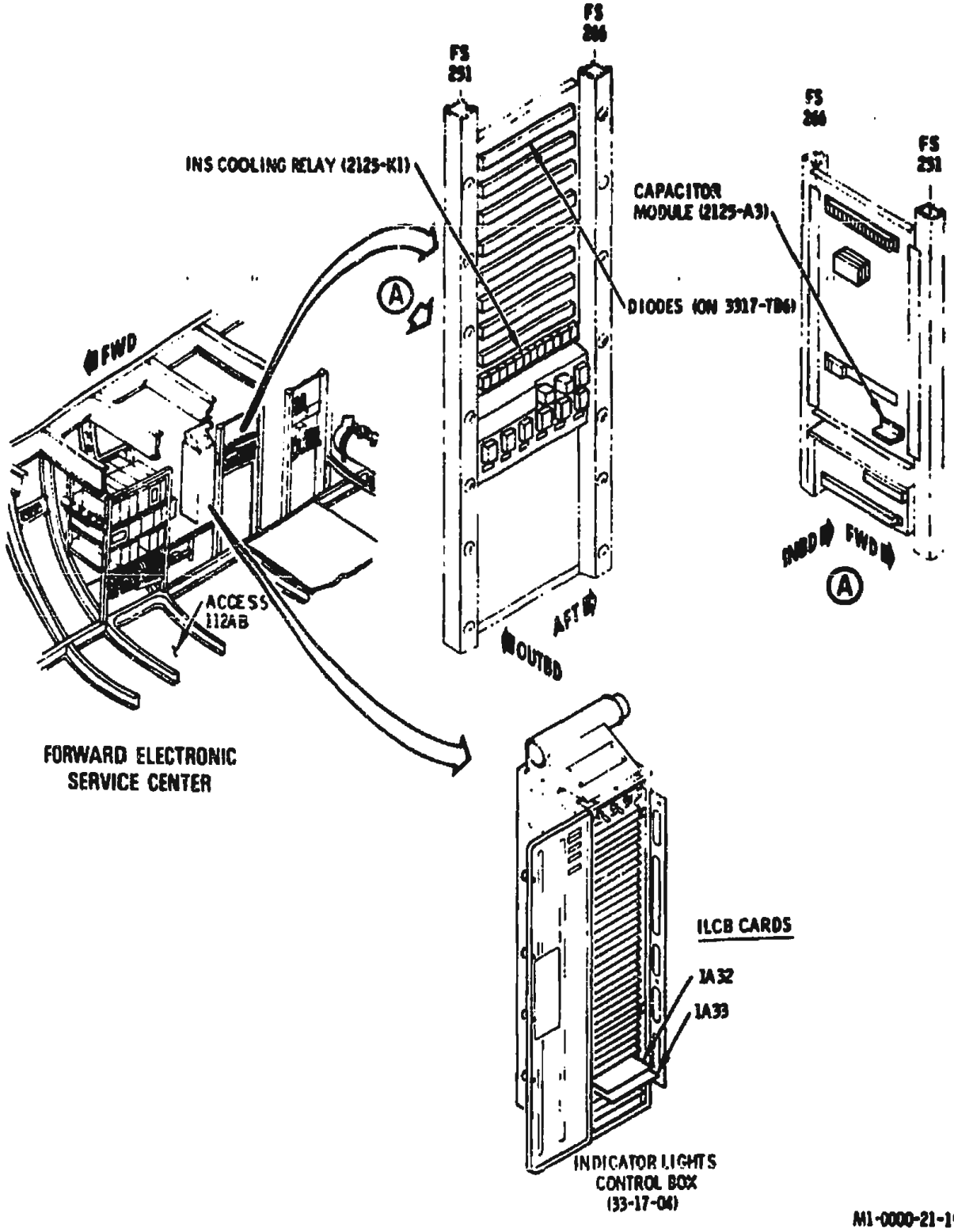


M1-0001-21-1452

R Component Locator Diagram
R FESC Cooling System
R Figure 102 (Sheet 2)

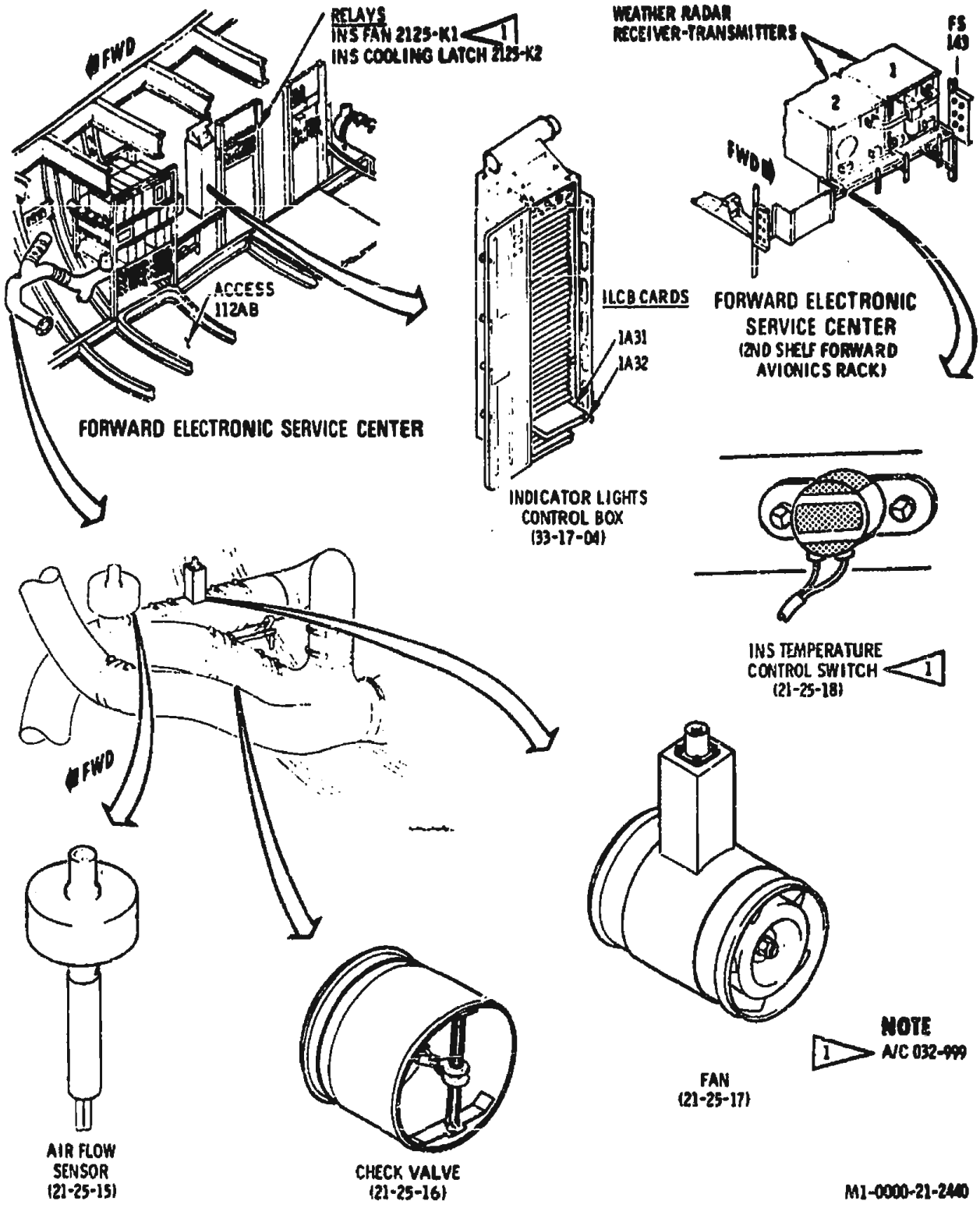
EFFECTIVITY: ALL

001B



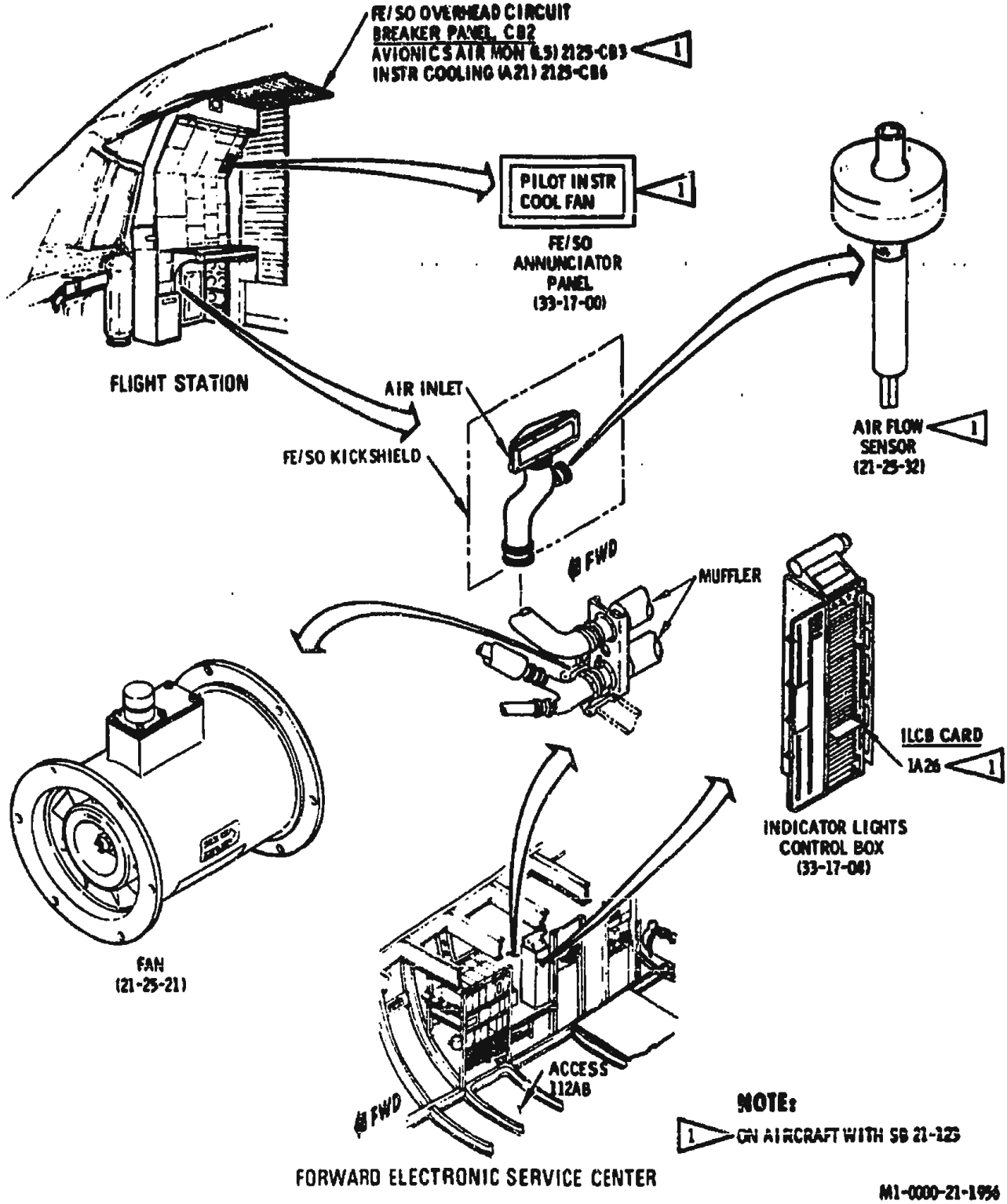
M1-0000-21-1962

Component Locator Diagram
INS Cooling System
Figure 102 (Sheet 3)



CR Component Locator Diagram
CR INS Cooling System
CR Figure 102 (Sheet 3)

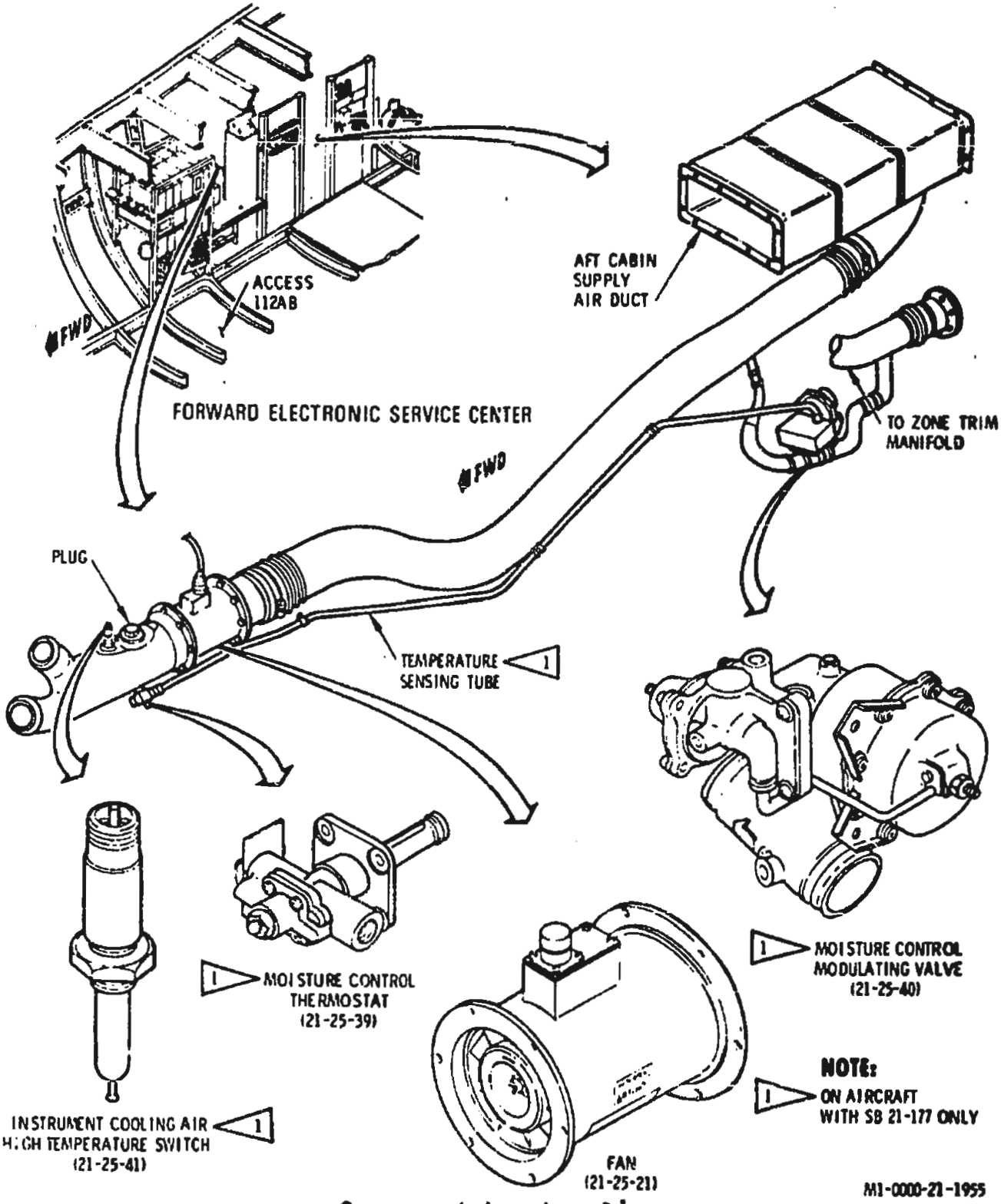
EFFECTIVITY: 018-999



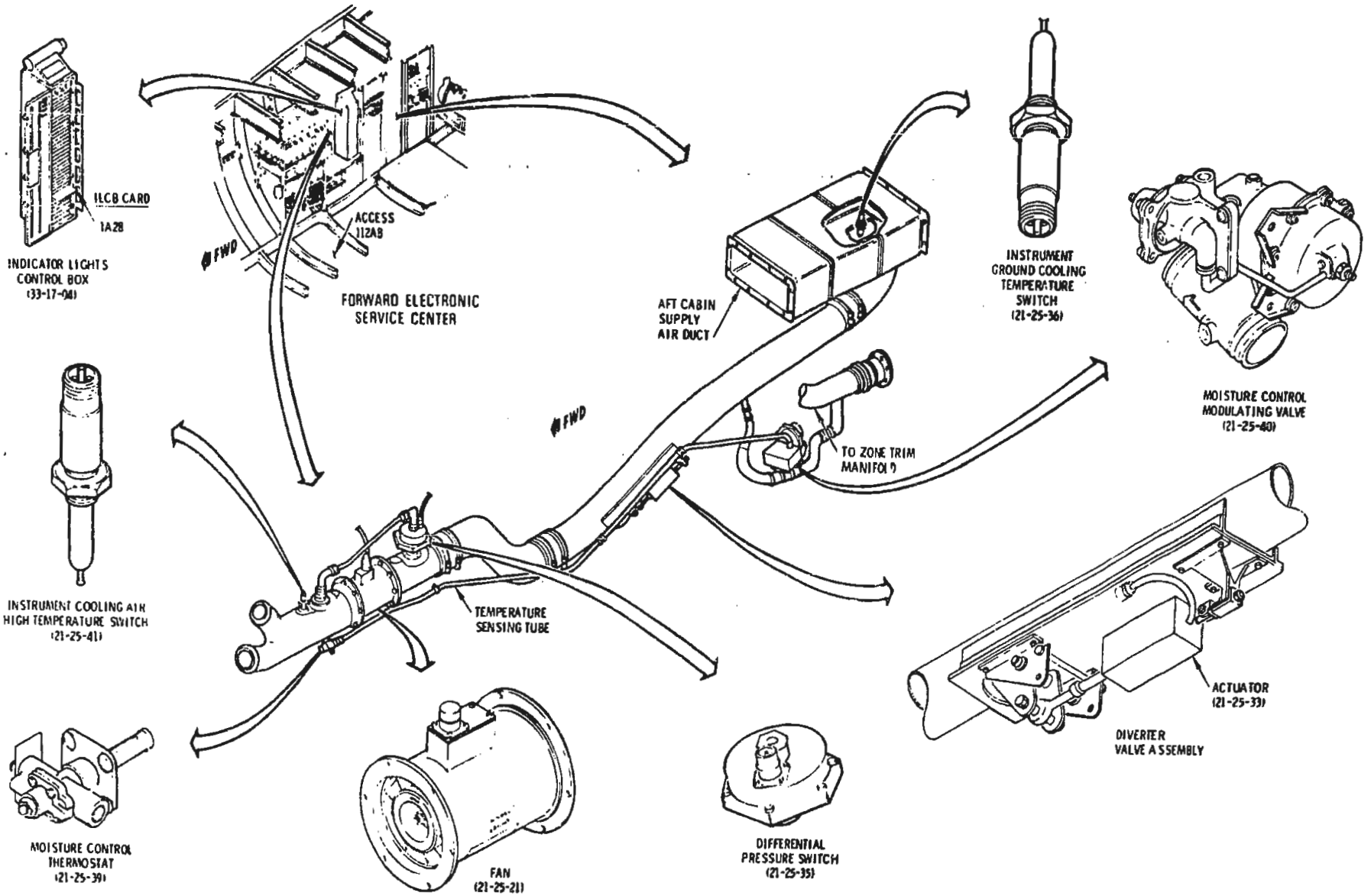
R Component Locator Diagram
R Instrument Cooling System
R Figure 102 (Sheet 4)

EFFECTIVITY: 001-031 WITHOUT SB21-143

001B



Component Locator Diagram
Instrument Cooling System
Figure 102 (Sheet 4)



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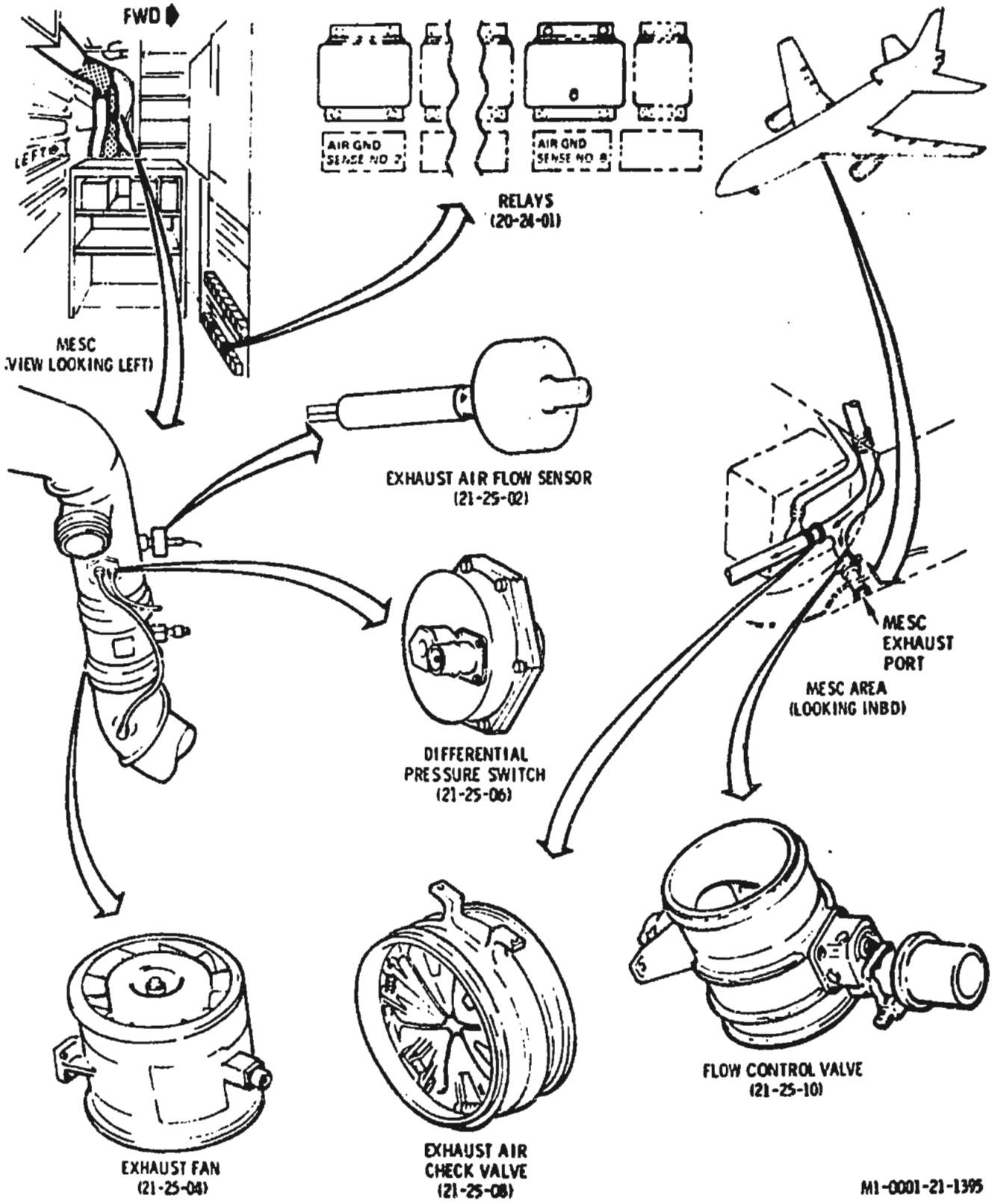
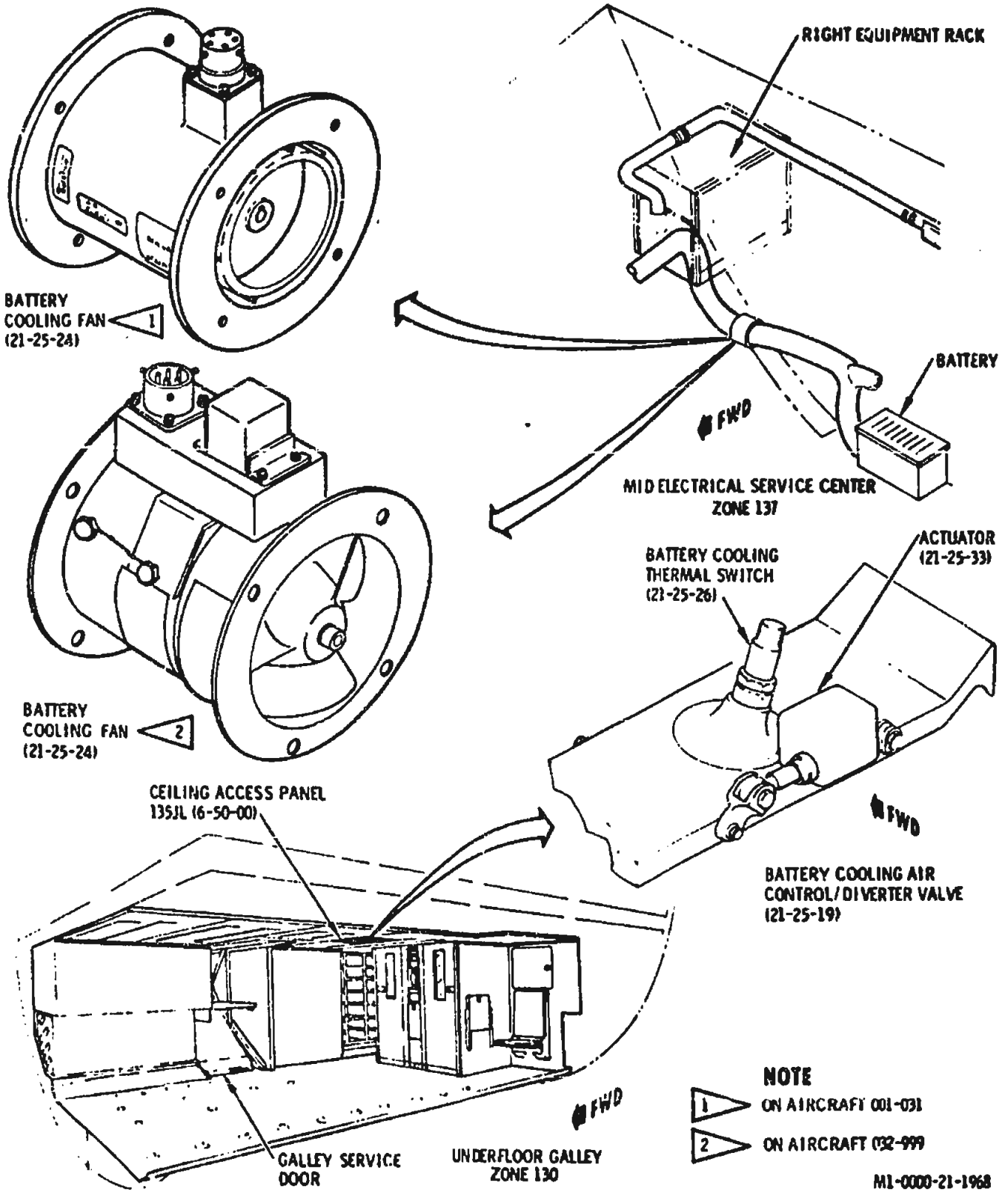
Component Locator Diagram
Instrument Cooling System
Figure 102 (Sheet 3)

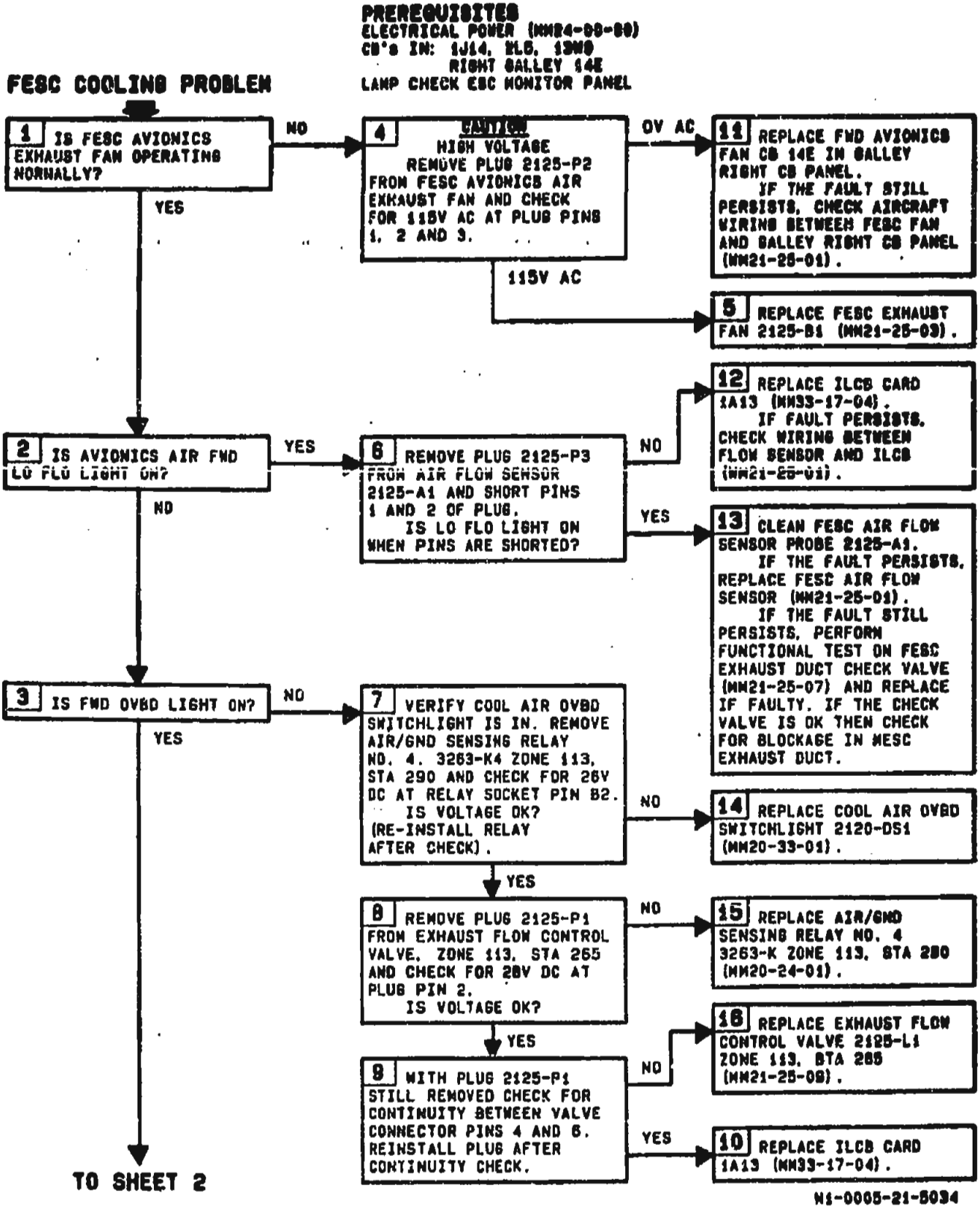
EFFECTIVITY: 032-999



Component Locator Diagram
MESC Cooling System
Figure 102 (Sheet 5)



Component Locator Diagram
Battery Cooling System
Figure 102 (Sheet 6)


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB's IN: 1J14, 2L6, 13M9
RIGHT GALLEY 14E
LAMP CHECK ESC MONITOR PANEL
FESC COOLING PROBLEM
1 IS FESC AVIONICS EXHAUST FAN OPERATING NORMALLY?
NO
YES
4 CAUTION HIGH VOLTAGE REMOVE PLUG 2125-P2 FROM FESC AVIONICS AIR EXHAUST FAN AND CHECK FOR 115V AC AT PLUG PINS 1, 2 AND 3.
OV AC
11 REPLACE FWD AVIONICS FAN CB 14E IN GALLEY RIGHT CB PANEL. IF THE FAULT STILL PERSISTS, CHECK AIRCRAFT WIRING BETWEEN FESC FAN AND GALLEY RIGHT CB PANEL (MM21-25-01).
115V AC
5 REPLACE FESC EXHAUST FAN 2125-B1 (MM21-25-03).
2 IS AVIONICS AIR FWD LO FLO LIGHT ON?
YES
NO
6 REMOVE PLUG 2125-P3 FROM AIR FLOW SENSOR 2125-A1 AND SHORT PINS 1 AND 2 OF PLUG. IS LO FLO LIGHT ON WHEN PINS ARE SHORTED?
NO
12 REPLACE ILCB CARD 1A13 (MM33-17-04). IF FAULT PERSISTS, CHECK WIRING BETWEEN FLOW SENSOR AND ILCB (MM21-25-01).
YES
13 CLEAN FESC AIR FLOW SENSOR PROBE 2125-A1. IF THE FAULT PERSISTS, REPLACE FESC AIR FLOW SENSOR (MM21-25-01). IF THE FAULT STILL PERSISTS, PERFORM FUNCTIONAL TEST ON FESC EXHAUST DUCT CHECK VALVE (MM21-25-07) AND REPLACE IF FAULTY. IF THE CHECK VALVE IS OK THEN CHECK FOR BLOCKAGE IN FESC EXHAUST DUCT.
3 IS FWD OVBD LIGHT ON?
NO
YES
7 VERIFY COOL AIR OVBD SWITCHLIGHT IS IN. REMOVE AIR/GND SENSING RELAY NO. 4. 3263-K4 ZONE 113, STA 290 AND CHECK FOR 28V DC AT RELAY SOCKET PIN B2. IS VOLTAGE OK? (RE-INSTALL RELAY AFTER CHECK).
NO
14 REPLACE COOL AIR OVBD SWITCHLIGHT 2120-DS1 (MM20-33-01).
YES
8 REMOVE PLUG 2125-P1 FROM EXHAUST FLOW CONTROL VALVE, ZONE 113, STA 265 AND CHECK FOR 28V DC AT PLUG PIN 2. IS VOLTAGE OK?
NO
15 REPLACE AIR/GND SENSING RELAY NO. 4 3263-K ZONE 113, STA 280 (MM20-24-01).
YES
9 WITH PLUG 2125-P1 STILL REMOVED CHECK FOR CONTINUITY BETWEEN VALVE CONNECTOR PINS 4 AND 6. REINSTALL PLUG AFTER CONTINUITY CHECK.
NO
16 REPLACE EXHAUST FLOW CONTROL VALVE 2125-L1 ZONE 113, STA 265 (MM21-25-09).
YES
10 REPLACE ILCB CARD 1A13 (MM33-17-04).
TO SHEET 2
M1-0005-21-5034

R FWD AVIONIC AIR Cooling Problem
R Figure 103 (Sheet 1)

EFFECTIVITY: ALL

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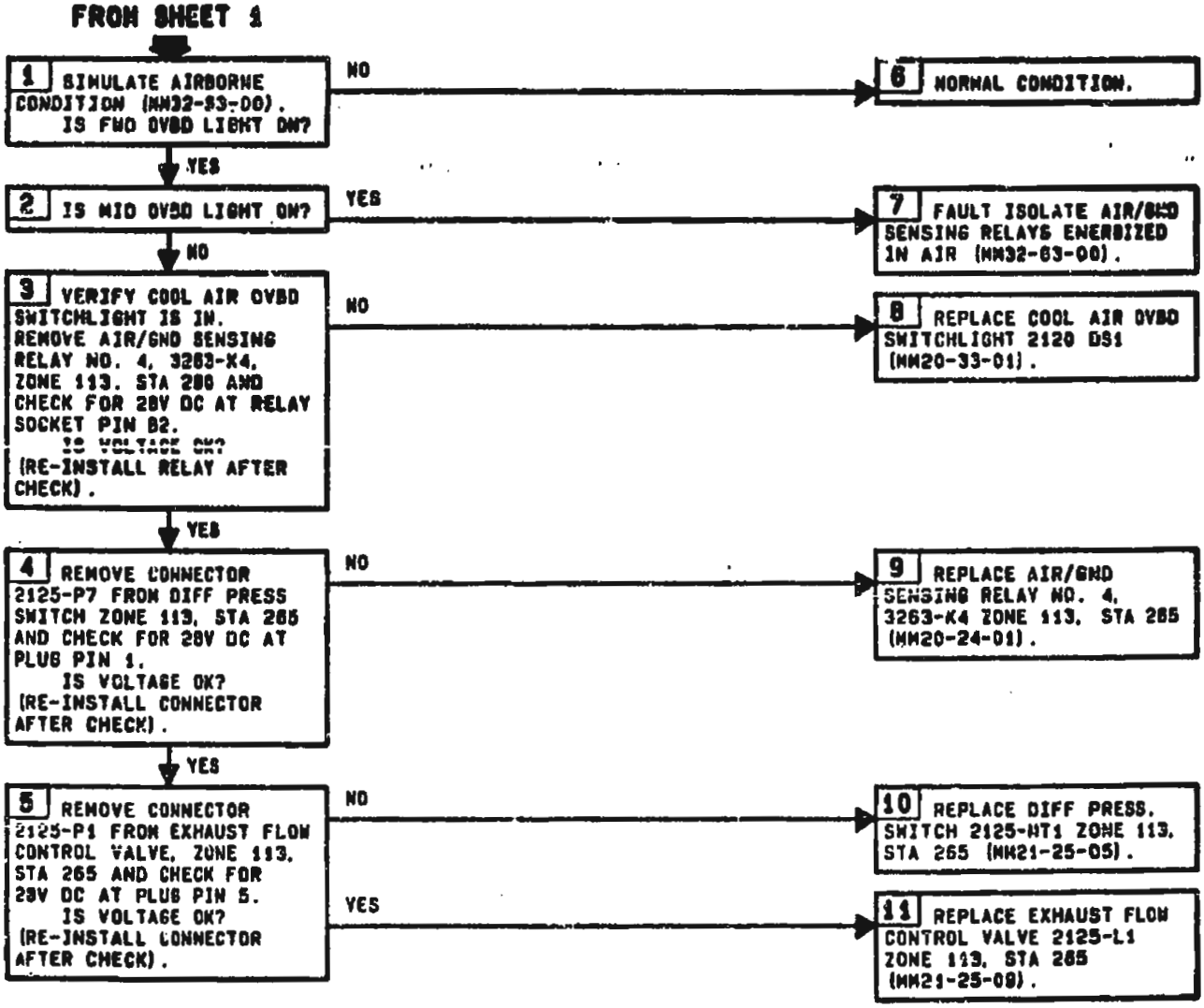
PREREQUISITES

ELECTRICAL POWER (MM24-00-00)
CB'S IN: 1J14, 2L8, RIGHT GALLEY 14E


FROM SHEET 1
1 SIMULATE AIRBORNE CONDITION (MM32-33-00). IS FWD OVBD LIGHT ON?
NO
6 NORMAL CONDITION.
YES
2 IS MID OVBD LIGHT ON?
YES
7 FAULT ISOLATE AIR/GND SENSING RELAYS ENERGIZED IN AIR (MM32-63-00).
NO
3 VERIFY COOL AIR OVBD SWITCHLIGHT IS IN. REMOVE AIR/GND SENSING RELAY NO. 4, 3263-K4, ZONE 113, STA 285 AND CHECK FOR 28V DC AT RELAY SOCKET PIN B2. IS VOLTAGE OK? (RE-INSTALL RELAY AFTER CHECK).
NO
8 REPLACE COOL AIR OVBD SWITCHLIGHT 2120 DS1 (MM20-33-01).
YES
4 REMOVE CONNECTOR 2125-P7 FROM DIFF PRESS SWITCH ZONE 113, STA 285 AND CHECK FOR 28V DC AT PLUG PIN 1. IS VOLTAGE OK? (RE-INSTALL CONNECTOR AFTER CHECK).
NO
9 REPLACE AIR/GND SENSING RELAY NO. 4, 3263-K4 ZONE 113, STA 285 (MM20-24-01).
YES
5 REMOVE CONNECTOR 2125-P1 FROM EXHAUST FLOW CONTROL VALVE, ZONE 113, STA 285 AND CHECK FOR 28V DC AT PLUG PIN 5. IS VOLTAGE OK? (RE-INSTALL CONNECTOR AFTER CHECK).
NO
10 REPLACE DIFF PRESS. SWITCH 2125-HT1 ZONE 113, STA 285 (MM21-25-05).
YES
11 REPLACE EXHAUST FLOW CONTROL VALVE 2125-L1 ZONE 113, STA 285 (MM21-25-09).

M1-0001-01-0004

R FWD AVIONIC AIR Cooling Problem
R Figure 103 (Sheet 2)

EFFECTIVITY: ALL

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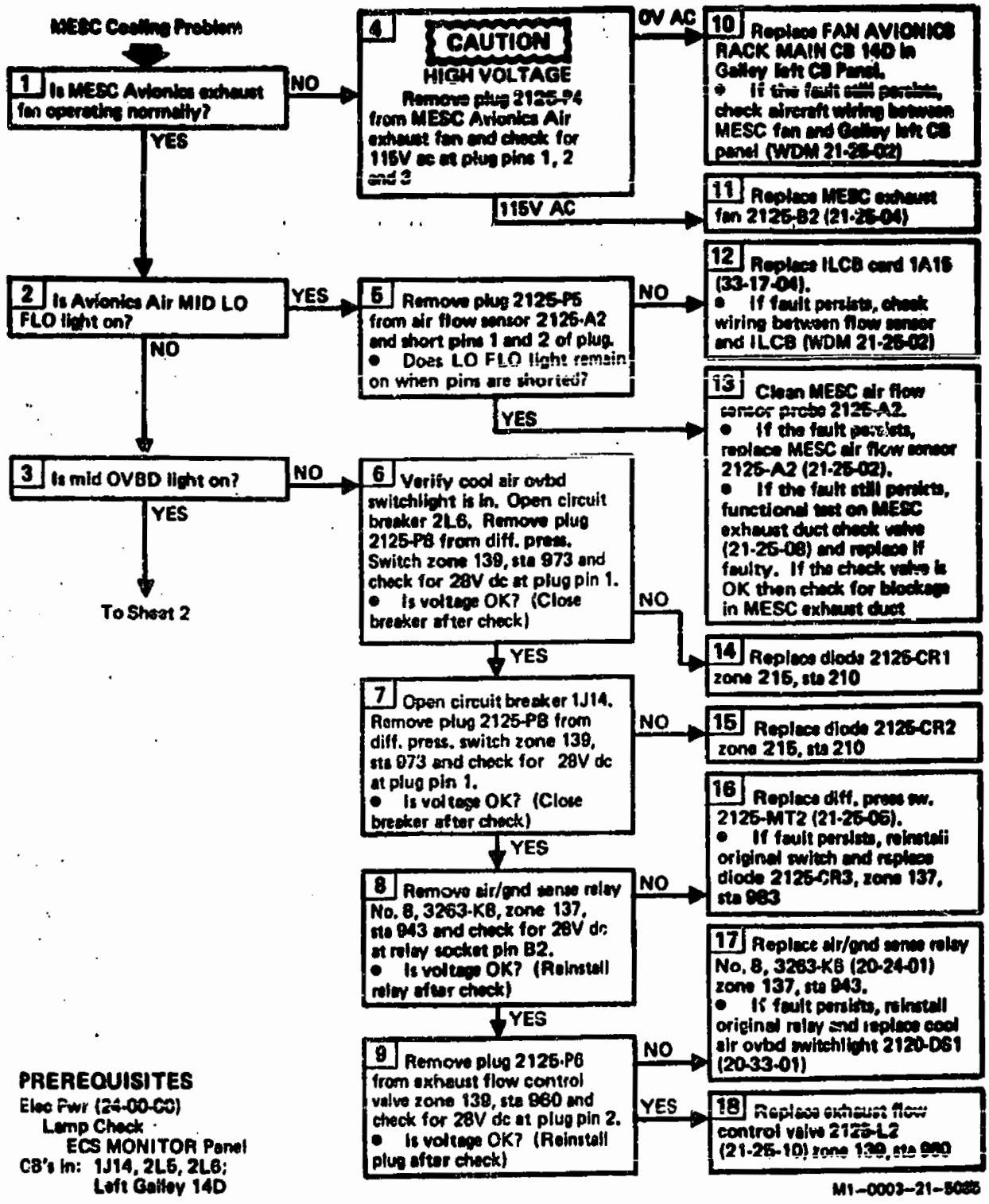
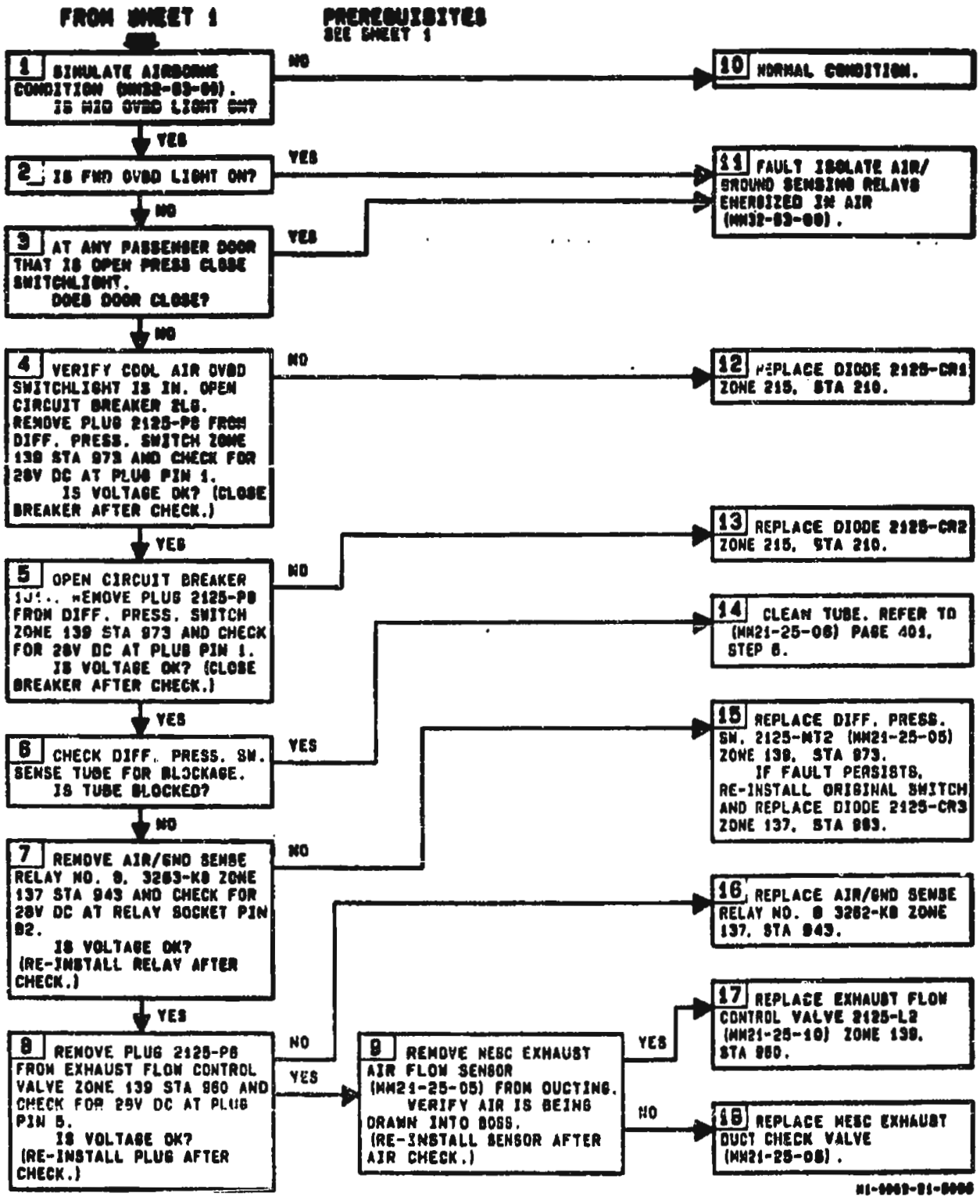

MESC Cooling Problem
1 Is MESC Avionics exhaust fan operating normally?
NO
YES
4 CAUTION HIGH VOLTAGE Remove plug 2125-P4 from MESC Avionics Air exhaust fan and check for 115V ac at plug pins 1, 2 and 3
0V AC
10 Replace FAN AVIONICS RACK MAIN CB 14D in Galley left CB Panel.
• If the fault still persists, check aircraft wiring between MESC fan and Galley left CB panel (WDM 21-25-02)
115V AC
11 Replace MESC exhaust fan 2125-B2 (21-25-04)
2 Is Avionics Air MID LO FLO light on?
YES
NO
5 Remove plug 2125-P5 from air flow sensor 2125-A2 and short pins 1 and 2 of plug.
• Does LO FLO light remain on when pins are shorted?
NO
12 Replace ILCB card 1A15 (33-17-04).
• If fault persists, check wiring between flow sensor and ILCB (WDM 21-25-02)
YES
13 Clean MESC air flow sensor probe 2125-A2.
• If the fault persists, replace MESC air flow sensor 2125-A2 (21-25-02).
• If the fault still persists, functional test on MESC exhaust duct check valve (21-25-08) and replace if faulty. If the check valve is OK then check for blockage in MESC exhaust duct
3 Is mid OVBD light on?
NO
YES
To Sheet 2
6 Verify cool air ovbd switchlight is in. Open circuit breaker 2L6. Remove plug 2125-P6 from diff. press. Switch zone 139, sta 973 and check for 28V dc at plug pin 1.
• Is voltage OK? (Close breaker after check)
NO
YES
14 Replace diode 2125-CR1 zone 215, sta 210
7 Open circuit breaker 1J14. Remove plug 2125-P8 from diff. press. switch zone 139, sta 973 and check for 28V dc at plug pin 1.
• Is voltage OK? (Close breaker after check)
NO
YES
15 Replace diode 2125-CR2 zone 215, sta 210
8 Remove air/gnd sense relay No. 8, 3263-K8, zone 137, sta 943 and check for 28V dc at relay socket pin B2.
• Is voltage OK? (Reinstall relay after check)
NO
YES
16 Replace diff. press sw. 2125-MT2 (21-25-05).
• If fault persists, reinstall original switch and replace diode 2125-CR3, zone 137, sta 983
9 Remove plug 2125-P6 from exhaust flow control valve zone 139, sta 960 and check for 28V dc at plug pin 2.
• Is voltage OK? (Reinstall plug after check)
NO
YES
17 Replace air/gnd sense relay No. 8, 3263-K8 (20-24-01) zone 137, sta 943.
• If fault persists, reinstall original relay and replace cool air ovbd switchlight 2120-D61 (20-33-01)
18 Replace exhaust flow control valve 2125-L2 (21-25-10) zone 139, sta 960
PREREQUISITES
Elec Pwr (24-00-00)
Lamp Check
ECS MONITOR Panel
CB's In: 1J14, 2L5, 2L6;
Left Galley 14D
M1-0003-21-5085

R MID AVIONIC AIR Cooling Problem
R Figure 104 (Sheet 1)

EFFECTIVITY: ALL

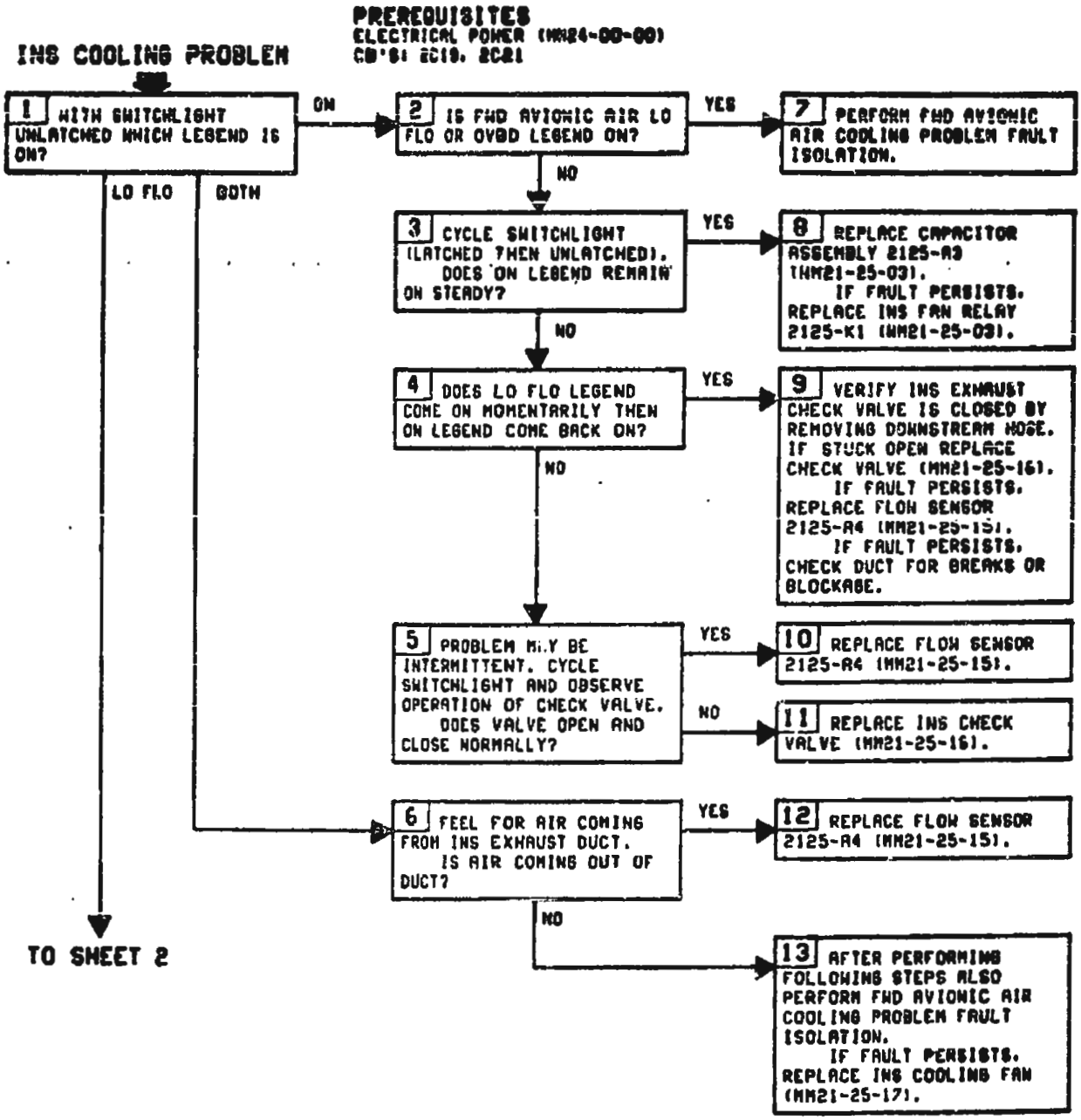
001B


FROM SHEET 1
PREREQUISITES
SEE SHEET 1
1 SIMULATE AIRBORNE CONDITION (MM32-63-00). IS MID OVBD LIGHT ON?
NO
10 NORMAL CONDITION.
YES
2 IS FWD OVBD LIGHT ON?
YES
11 FAULT ISOLATE AIR/ GROUND SENSING RELAYS ENERGIZED IN AIR (MM32-63-00).
NO
3 AT ANY PASSENGER DOOR THAT IS OPEN PRESS CLOSE SWITCHLIGHT. DOES DOOR CLOSE?
YES
NO
4 VERIFY COOL AIR OVBD SWITCHLIGHT IS IN. OPEN CIRCUIT BREAKER 2L6. REMOVE PLUG 2125-P8 FROM DIFF. PRESS. SWITCH ZONE 139 STA 973 AND CHECK FOR 28V DC AT PLUG PIN 1. IS VOLTAGE OK? (CLOSE BREAKER AFTER CHECK.)
NO
12 REPLACE DIODE 2125-CR1 ZONE 215, STA 210.
YES
5 OPEN CIRCUIT BREAKER 1J1.. REMOVE PLUG 2125-P8 FROM DIFF. PRESS. SWITCH ZONE 139 STA 973 AND CHECK FOR 28V DC AT PLUG PIN 1. IS VOLTAGE OK? (CLOSE BREAKER AFTER CHECK.)
NO
13 REPLACE DIODE 2125-CR2 ZONE 215, STA 210.
YES
6 CHECK DIFF. PRESS. SW. SENSE TUBE FOR BLOCKAGE. IS TUBE BLOCKED?
YES
14 CLEAN TUBE. REFER TO (MM21-25-06) PAGE 401, STEP 6.
NO
7 REMOVE AIR/GND SENSE RELAY NO. 8, 3283-K8 ZONE 137 STA 943 AND CHECK FOR 28V DC AT RELAY SOCKET PIN B2. IS VOLTAGE OK? (RE-INSTALL RELAY AFTER CHECK.)
NO
15 REPLACE DIFF. PRESS. SW. 2125-MT2 (MM21-25-05) ZONE 139, STA 973. IF FAULT PERSISTS, RE-INSTALL ORIGINAL SWITCH AND REPLACE DIODE 2125-CR3 ZONE 137, STA 983.
YES
16 REPLACE AIR/GND SENSE RELAY NO. 8 3282-K8 ZONE 137, STA 943.
NO
8 REMOVE PLUG 2125-P8 FROM EXHAUST FLOW CONTROL VALVE ZONE 139 STA 960 AND CHECK FOR 28V DC AT PLUG PIN B. IS VOLTAGE OK? (RE-INSTALL PLUG AFTER CHECK.)
YES
9 REMOVE NESC EXHAUST AIR FLOW SENSOR (MM21-25-05) FROM DUCTING. VERIFY AIR IS BEING DRAWN INTO BOSS. (RE-INSTALL SENSOR AFTER AIR CHECK.)
YES
17 REPLACE EXHAUST FLOW CONTROL VALVE 2125-L2 (MM21-25-10) ZONE 139, STA 960.
NO
18 REPLACE NESC EXHAUST DUCT CHECK VALVE (MM21-25-05).

R MID AVIONIC AIR Cooling Problem
R Figure 104 (Sheet 2)

EFFECTIVITY: ALL

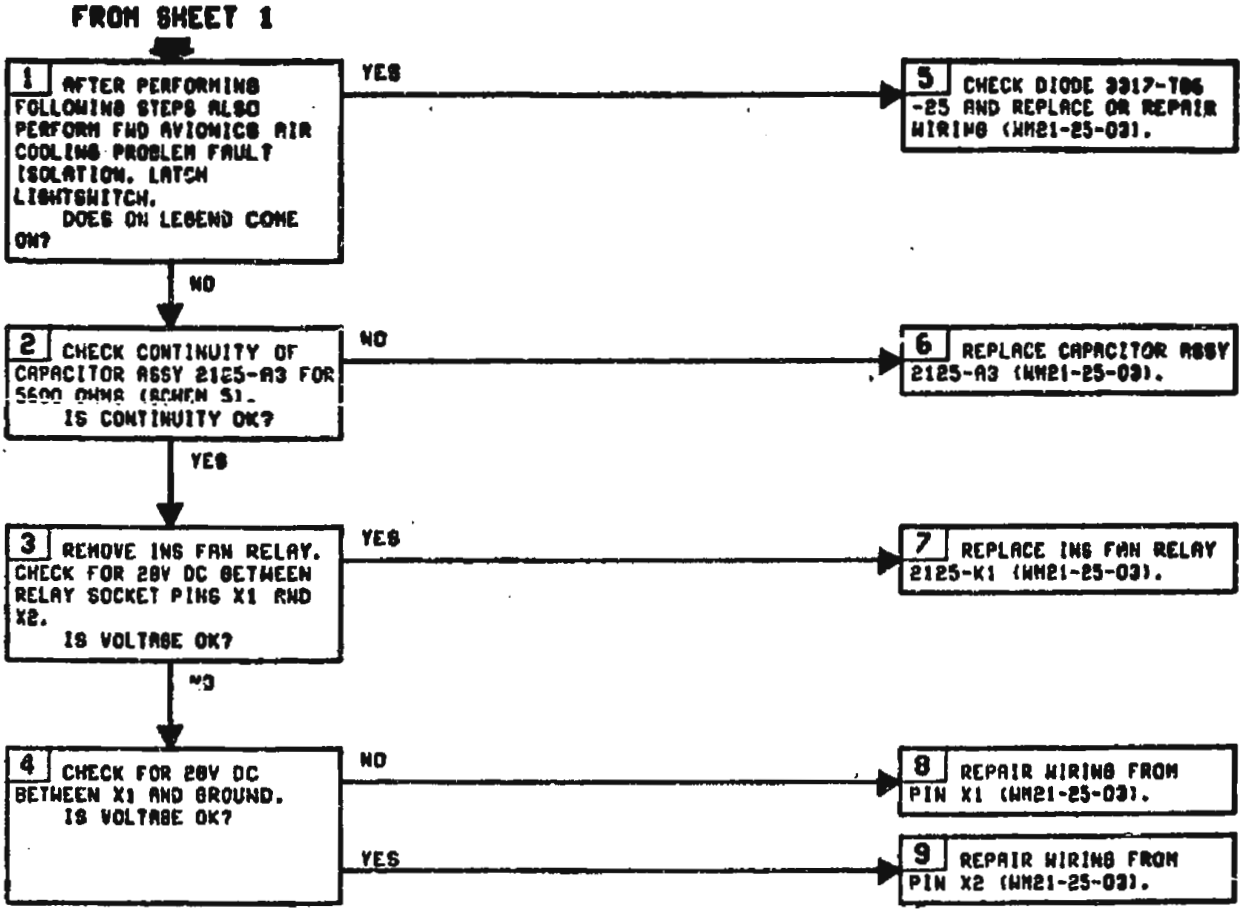
0018


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: 2C19, 2C21
INS COOLING PROBLEM
1 WITH SWITCHLIGHT UNLATCHED WHICH LEGEND IS ON?
ON
LO FLO
BOTH
2 IS FWD AVIONIC AIR LO FLO OR OVBD LEGEND ON?
YES
7 PERFORM FWD AVIONIC AIR COOLING PROBLEM FAULT ISOLATION.
NO
3 CYCLE SWITCHLIGHT (LATCHED THEN UNLATCHED). DOES ON LEGEND REMAIN ON STEADY?
YES
8 REPLACE CAPACITOR ASSEMBLY 2125-A3 (MM21-25-03). IF FAULT PERSISTS. REPLACE INS FAN RELAY 2125-K1 (MM21-25-03).
NO
4 DOES LO FLO LEGEND COME ON MOMENTARILY THEN ON LEGEND COME BACK ON?
YES
9 VERIFY INS EXHAUST CHECK VALVE IS CLOSED BY REMOVING DOWNSTREAM HOSE. IF STUCK OPEN REPLACE CHECK VALVE (MM21-25-16). IF FAULT PERSISTS. REPLACE FLOW SENSOR 2125-A4 (MM21-25-15). IF FAULT PERSISTS. CHECK DUCT FOR BREAKS OR BLOCKAGE.
NO
5 PROBLEM MAY BE INTERMITTENT. CYCLE SWITCHLIGHT AND OBSERVE OPERATION OF CHECK VALVE. DOES VALVE OPEN AND CLOSE NORMALLY?
YES
10 REPLACE FLOW SENSOR 2125-A4 (MM21-25-15).
NO
11 REPLACE INS CHECK VALVE (MM21-25-16).
6 FEEL FOR AIR COMING FROM INS EXHAUST DUCT. IS AIR COMING OUT OF DUCT?
YES
12 REPLACE FLOW SENSOR 2125-A4 (MM21-25-15).
NO
13 AFTER PERFORMING FOLLOWING STEPS ALSO PERFORM FWD AVIONIC AIR COOLING PROBLEM FAULT ISOLATION. IF FAULT PERSISTS. REPLACE INS COOLING FAN (MM21-25-17).
TO SHEET 2

M1-0000-21-0187

INS Cooling Problem
Figure 105 (Sheet 1)

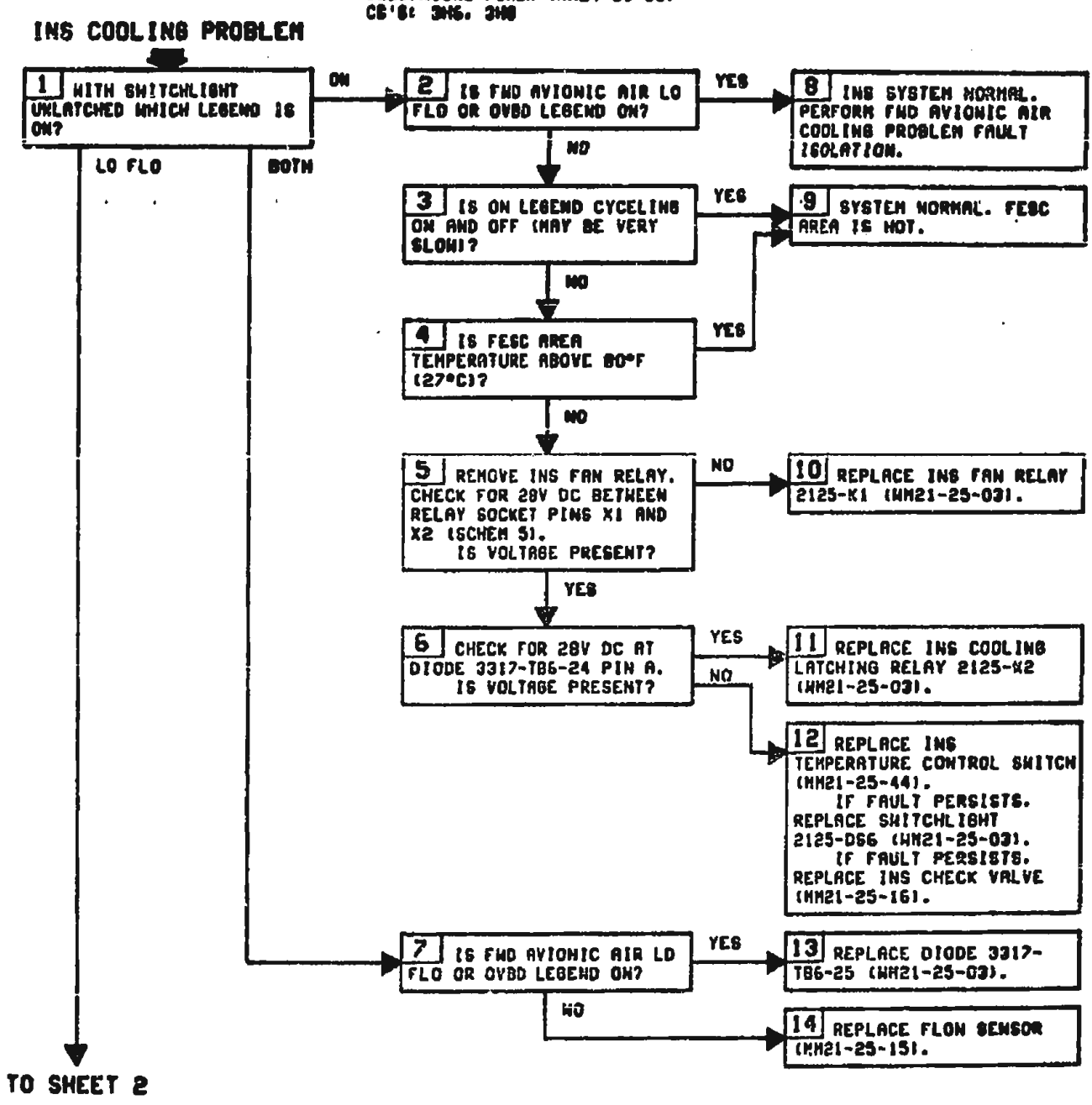
PREREQUISITES
SEE SHEET 1


FROM SHEET 1
1 AFTER PERFORMING FOLLOWING STEPS ALSO PERFORM FWD AVIONICS AIR COOLING PROBLEM FAULT ISOLATION. LATCH LIGHTSWITCH.
DOES ON LEGEND COME ON?
YES
5 CHECK DIODE 3317-TB6 -25 AND REPLACE OR REPAIR WIRING (WM21-25-03).
NO
2 CHECK CONTINUITY OF CAPACITOR ASSY 2125-A3 FOR 5600 OHMS (BETWEEN S).
IS CONTINUITY OK?
NO
6 REPLACE CAPACITOR ASSY 2125-A3 (WM21-25-03).
YES
3 REMOVE INS FAN RELAY. CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2.
IS VOLTAGE OK?
YES
7 REPLACE INS FAN RELAY 2125-K1 (WM21-25-03).
NO
4 CHECK FOR 28V DC BETWEEN X1 AND GROUND.
IS VOLTAGE OK?
NO
8 REPAIR WIRING FROM PIN X1 (WM21-25-03).
YES
9 REPAIR WIRING FROM PIN X2 (WM21-25-03).

M1-0001-81-1507

INS Cooling Problems
Figure 105 (Sheet 2)

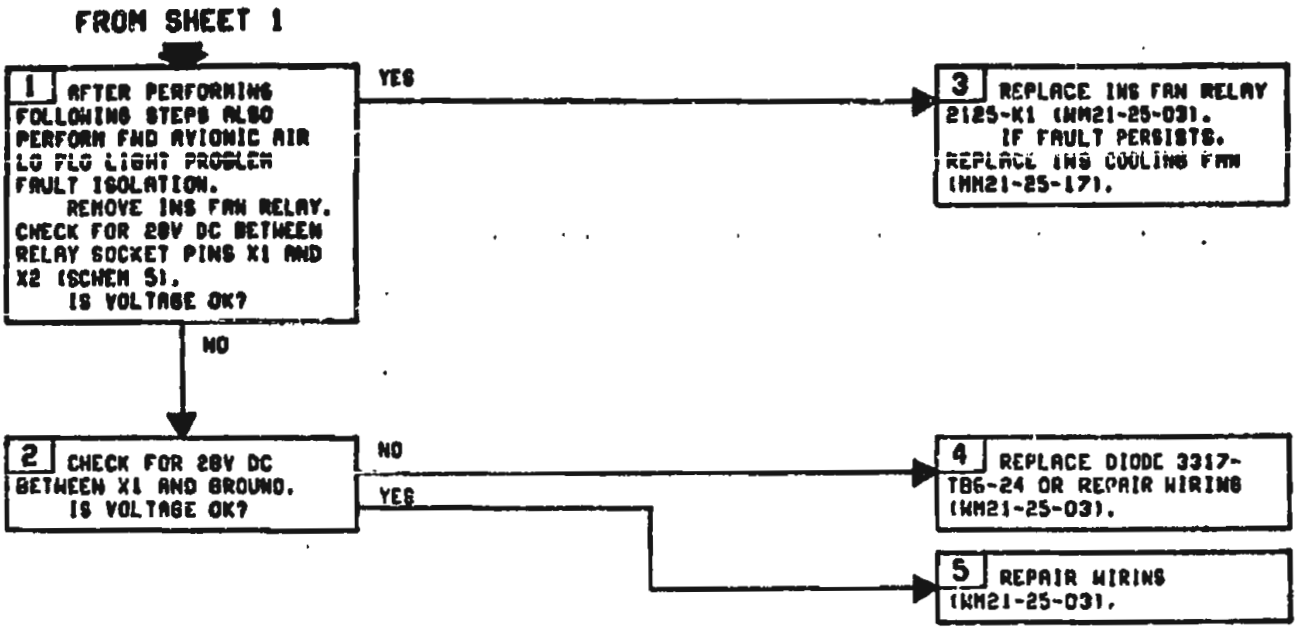
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: 3M5, 3M8


INS COOLING PROBLEM
1 WITH SWITCHLIGHT UNLATCHED WHICH LEGEND IS ON?
ON
LO FLO
BOTH
2 IS FWD AVIONIC AIR LO FLO OR OVBD LEGEND ON?
YES
NO
8 INS SYSTEM NORMAL. PERFORM FWD AVIONIC AIR COOLING PROBLEM FAULT ISOLATION.
3 IS ON LEGEND CYCELING ON AND OFF (MAY BE VERY SLOW)?
YES
NO
9 SYSTEM NORMAL. FESC AREA IS HOT.
4 IS FESC AREA TEMPERATURE ABOVE 80°F (27°C)?
YES
NO
5 REMOVE INS FAN RELAY. CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2 (SCHEM 5). IS VOLTAGE PRESENT?
NO
10 REPLACE INS FAN RELAY 2125-K1 (MM21-25-03).
YES
6 CHECK FOR 28V DC AT DIODE 3317-TB6-24 PIN A. IS VOLTAGE PRESENT?
YES
NO
11 REPLACE INS COOLING LATCHING RELAY 2125-K2 (MM21-25-03).
12 REPLACE INS TEMPERATURE CONTROL SWITCH (MM21-25-44). IF FAULT PERSISTS. REPLACE SWITCHLIGHT 2125-D66 (MM21-25-03). IF FAULT PERSISTS. REPLACE INS CHECK VALVE (MM21-25-16).
7 IS FWD AVIONIC AIR LO FLO OR OVBD LEGEND ON?
YES
NO
13 REPLACE DIODE 3317-TB6-25 (MM21-25-03).
14 REPLACE FLOW SENSOR (MM21-25-15).
TO SHEET 2

M1-0000-21-2140

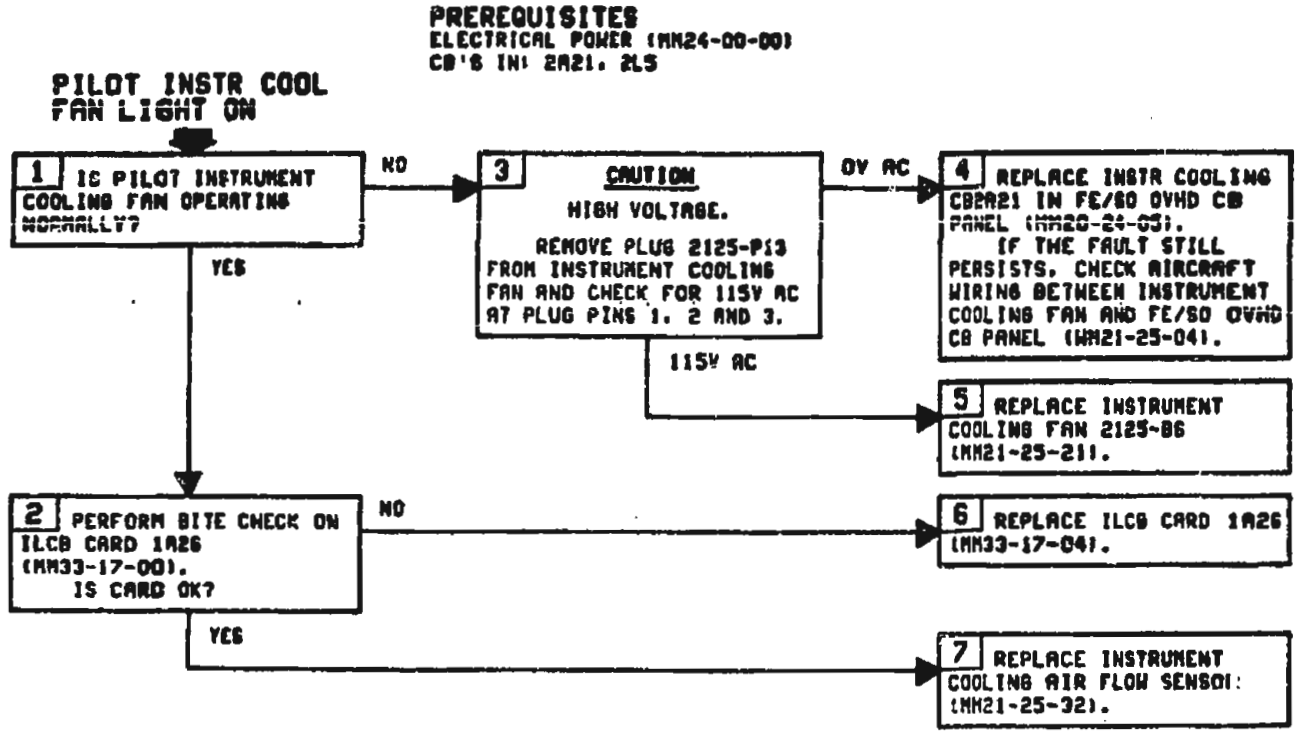
R INS Cooling Problems
R Figure 105 (Sheet 1)

PREREQUISITES
SEE SHEET 1

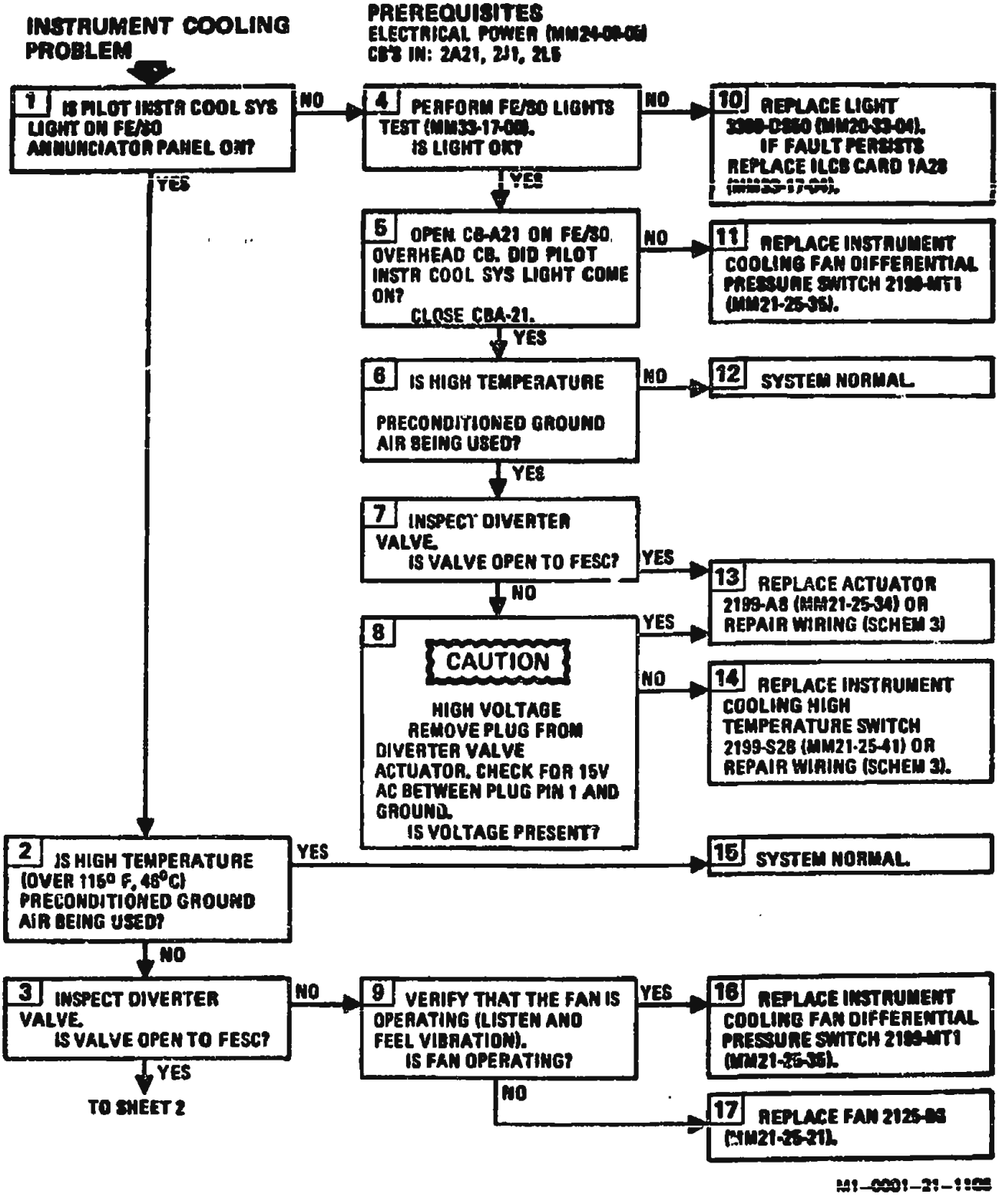

FROM SHEET 1
1 AFTER PERFORMING FOLLOWING STEPS ALSO PERFORM FWD AVIONIC AIR LO FLO LIGHT PROBLEM FAULT ISOLATION.
REMOVE INS FAN RELAY. CHECK FOR 28V DC BETWEEN RELAY SOCKET PINS X1 AND X2 (SCHEM 5).
IS VOLTAGE OK?
YES
3 REPLACE INS FAN RELAY 2125-K1 (WM21-25-031).
IF FAULT PERSISTS. REPLACE INS COOLING FAN (WM21-25-17).
NO
2 CHECK FOR 28V DC BETWEEN X1 AND GROUND.
IS VOLTAGE OK?
NO
4 REPLACE DIODE 3317-TB6-24 OR REPAIR WIRING (WM21-25-03).
YES
5 REPAIR WIRING (WM21-25-031).

MI-0000-21-2141

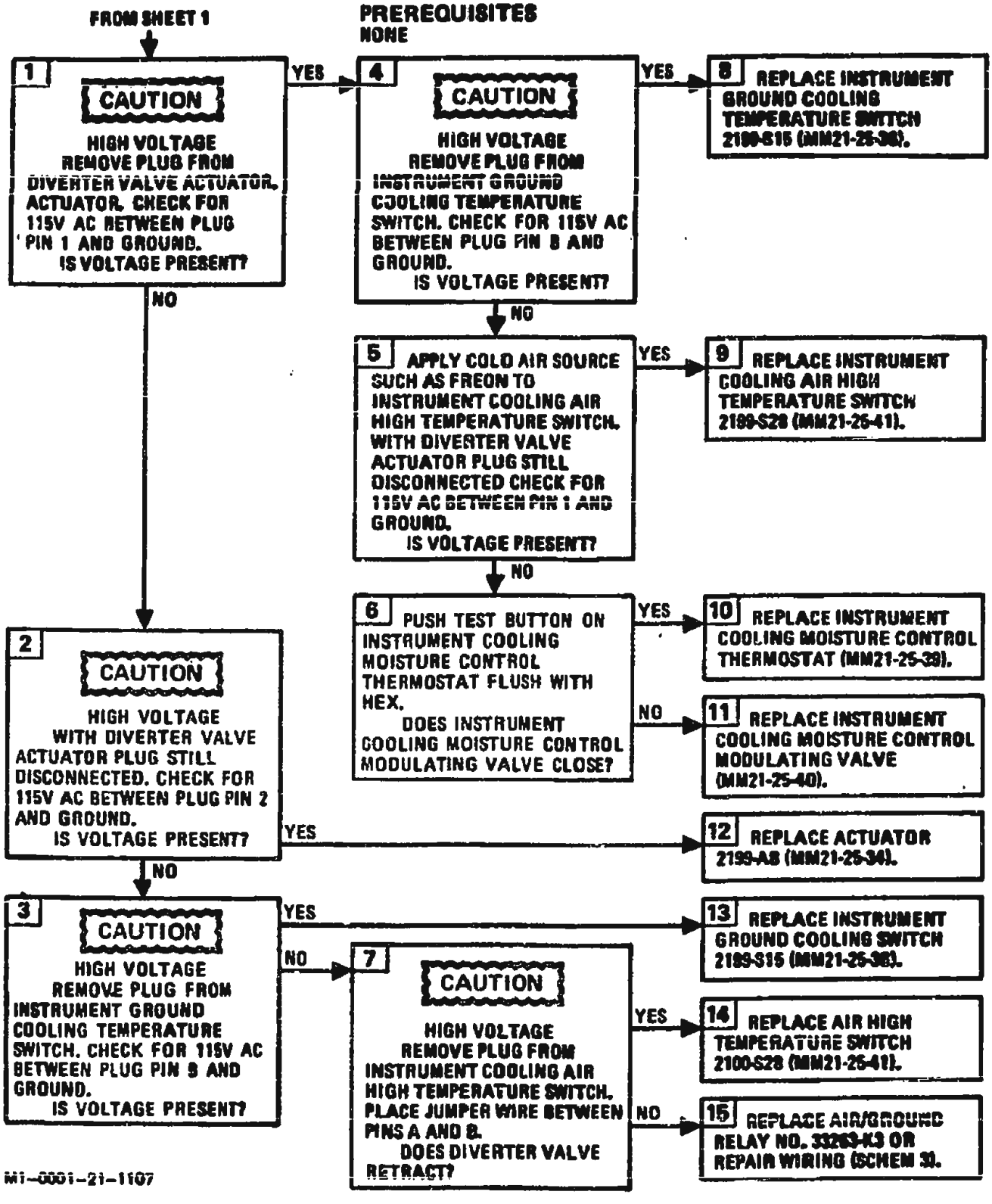
R INS Cooling Problems
R Figure 105 (Sheet 2)


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: 2A21, 2L5
PILOT INSTR COOL FAN LIGHT ON
1 IS PILOT INSTRUMENT COOLING FAN OPERATING NORMALLY?
NO
YES
3 CAUTION
HIGH VOLTAGE.
REMOVE PLUG 2125-P13 FROM INSTRUMENT COOLING FAN AND CHECK FOR 115V AC AT PLUG PINS 1, 2 AND 3.
0V AC
115V AC
4 REPLACE INSTR COOLING CBR21 IN FE/SD OVHD CB PANEL (MM20-24-03).
IF THE FAULT STILL PERSISTS, CHECK AIRCRAFT WIRING BETWEEN INSTRUMENT COOLING FAN AND FE/SD OVHD CB PANEL (MM21-25-04).
5 REPLACE INSTRUMENT COOLING FAN 2125-B6 (MM21-25-21).
2 PERFORM BITE CHECK ON ILCB CARD 1A26 (MM33-17-00).
IS CARD OK?
NO
YES
6 REPLACE ILCB CARD 1A26 (MM33-17-04).
7 REPLACE INSTRUMENT COOLING AIR FLOW SENSOR (MM21-25-32).

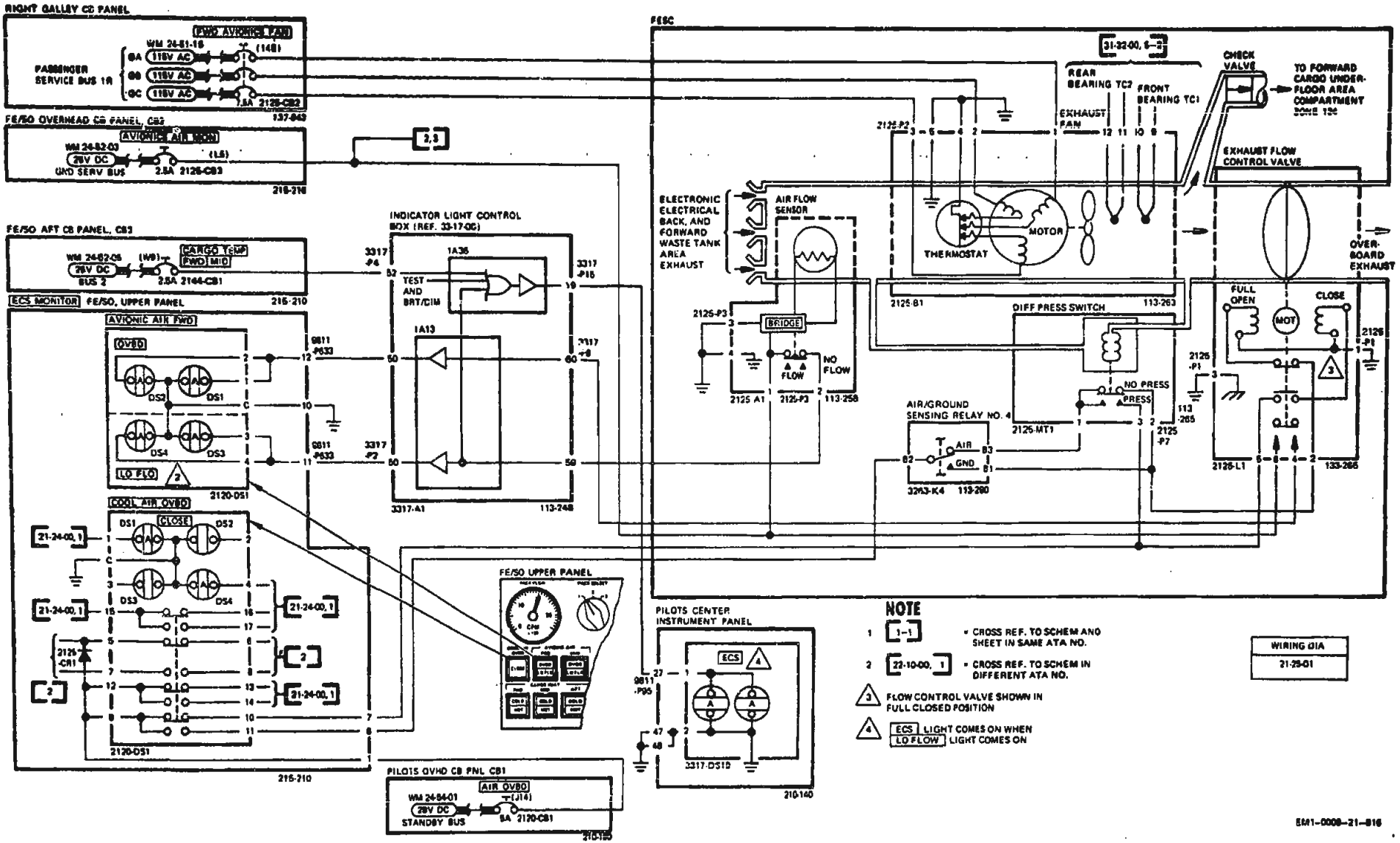
Instrument Cooling Problem
Figure 106


INSTRUMENT COOLING PROBLEM
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: 2A21, 2J1, 2L5
1 IS PILOT INSTR COOL SYS LIGHT ON FE/SO ANNUNCIATOR PANEL ON?
NO
YES
4 PERFORM FE/SO LIGHTS TEST (MM33-17-00). IS LIGHT OK?
NO
YES
10 REPLACE LIGHT 3388-0350 (MM20-33-04). IF FAULT PERSISTS REPLACE ILCB CARD 1A28 (MM33-17-00).
5 OPEN CB-A21 ON FE/SO OVERHEAD CB. DID PILOT INSTR COOL SYS LIGHT COME ON? CLOSE CBA-21.
NO
YES
11 REPLACE INSTRUMENT COOLING FAN DIFFERENTIAL PRESSURE SWITCH 2199-MT1 (MM21-25-35).
6 IS HIGH TEMPERATURE PRECONDITIONED GROUND AIR BEING USED?
NO
YES
12 SYSTEM NORMAL.
7 INSPECT DIVERTER VALVE. IS VALVE OPEN TO FESC?
YES
NO
13 REPLACE ACTUATOR 2199-A8 (MM21-25-34) OR REPAIR WIRING (SCHEM 3)
8 CAUTION HIGH VOLTAGE REMOVE PLUG FROM DIVERTER VALVE ACTUATOR. CHECK FOR 15V AC BETWEEN PLUG PIN 1 AND GROUND. IS VOLTAGE PRESENT?
YES
NO
14 REPLACE INSTRUMENT COOLING HIGH TEMPERATURE SWITCH 2199-S28 (MM21-25-41) OR REPAIR WIRING (SCHEM 3).
2 IS HIGH TEMPERATURE (OVER 115° F, 46°C) PRECONDITIONED GROUND AIR BEING USED?
YES
15 SYSTEM NORMAL.
NO
3 INSPECT DIVERTER VALVE. IS VALVE OPEN TO FESC?
NO
9 VERIFY THAT THE FAN IS OPERATING (LISTEN AND FEEL VIBRATION). IS FAN OPERATING?
YES
16 REPLACE INSTRUMENT COOLING FAN DIFFERENTIAL PRESSURE SWITCH 2199-MT1 (MM21-25-35).
NO
17 REPLACE FAN 2125-B3 (MM21-25-21).
YES
TO SHEET 2
M1-0001-21-1105

Instrument Cooling Problems
Figure 106 (Sheet 1)


FROM SHEET 1
PREREQUISITES
NONE
1
CAUTION
HIGH VOLTAGE
REMOVE PLUG FROM DIVERTER VALVE ACTUATOR. ACTUATOR. CHECK FOR 115V AC BETWEEN PLUG PIN 1 AND GROUND.
IS VOLTAGE PRESENT?
YES
NO
4
CAUTION
HIGH VOLTAGE
REMOVE PLUG FROM INSTRUMENT GROUND COOLING TEMPERATURE SWITCH. CHECK FOR 115V AC BETWEEN PLUG PIN B AND GROUND.
IS VOLTAGE PRESENT?
YES
NO
8
REPLACE INSTRUMENT GROUND COOLING TEMPERATURE SWITCH 2199-S15 (MM21-25-36).
5
APPLY COLD AIR SOURCE SUCH AS FREON TO INSTRUMENT COOLING AIR HIGH TEMPERATURE SWITCH. WITH DIVERTER VALVE ACTUATOR PLUG STILL DISCONNECTED CHECK FOR 115V AC BETWEEN PIN 1 AND GROUND.
IS VOLTAGE PRESENT?
YES
NO
9
REPLACE INSTRUMENT COOLING AIR HIGH TEMPERATURE SWITCH 2199-S28 (MM21-25-41).
6
PUSH TEST BUTTON ON INSTRUMENT COOLING MOISTURE CONTROL THERMOSTAT FLUSH WITH HEX.
DOES INSTRUMENT COOLING MOISTURE CONTROL MODULATING VALVE CLOSE?
YES
NO
10
REPLACE INSTRUMENT COOLING MOISTURE CONTROL THERMOSTAT (MM21-25-39).
11
REPLACE INSTRUMENT COOLING MOISTURE CONTROL MODULATING VALVE (MM21-25-40).
2
CAUTION
HIGH VOLTAGE
WITH DIVERTER VALVE ACTUATOR PLUG STILL DISCONNECTED. CHECK FOR 115V AC BETWEEN PLUG PIN 2 AND GROUND.
IS VOLTAGE PRESENT?
YES
NO
12
REPLACE ACTUATOR 2199-A8 (MM21-25-34).
3
CAUTION
HIGH VOLTAGE
REMOVE PLUG FROM INSTRUMENT GROUND COOLING TEMPERATURE SWITCH. CHECK FOR 115V AC BETWEEN PLUG PIN B AND GROUND.
IS VOLTAGE PRESENT?
YES
NO
13
REPLACE INSTRUMENT GROUND COOLING SWITCH 2199-S15 (MM21-25-36).
7
CAUTION
HIGH VOLTAGE
REMOVE PLUG FROM INSTRUMENT COOLING AIR HIGH TEMPERATURE SWITCH. PLACE JUMPER WIRE BETWEEN PINS A AND B.
DOES DIVERTER VALVE RETRACT?
YES
NO
14
REPLACE AIR HIGH TEMPERATURE SWITCH 2100-S28 (MM21-25-41).
15
REPLACE AIR/GROUND RELAY NO. 33263-K3 OR REPAIR WIRING (SCHEM 3).
MI-0001-21-1107

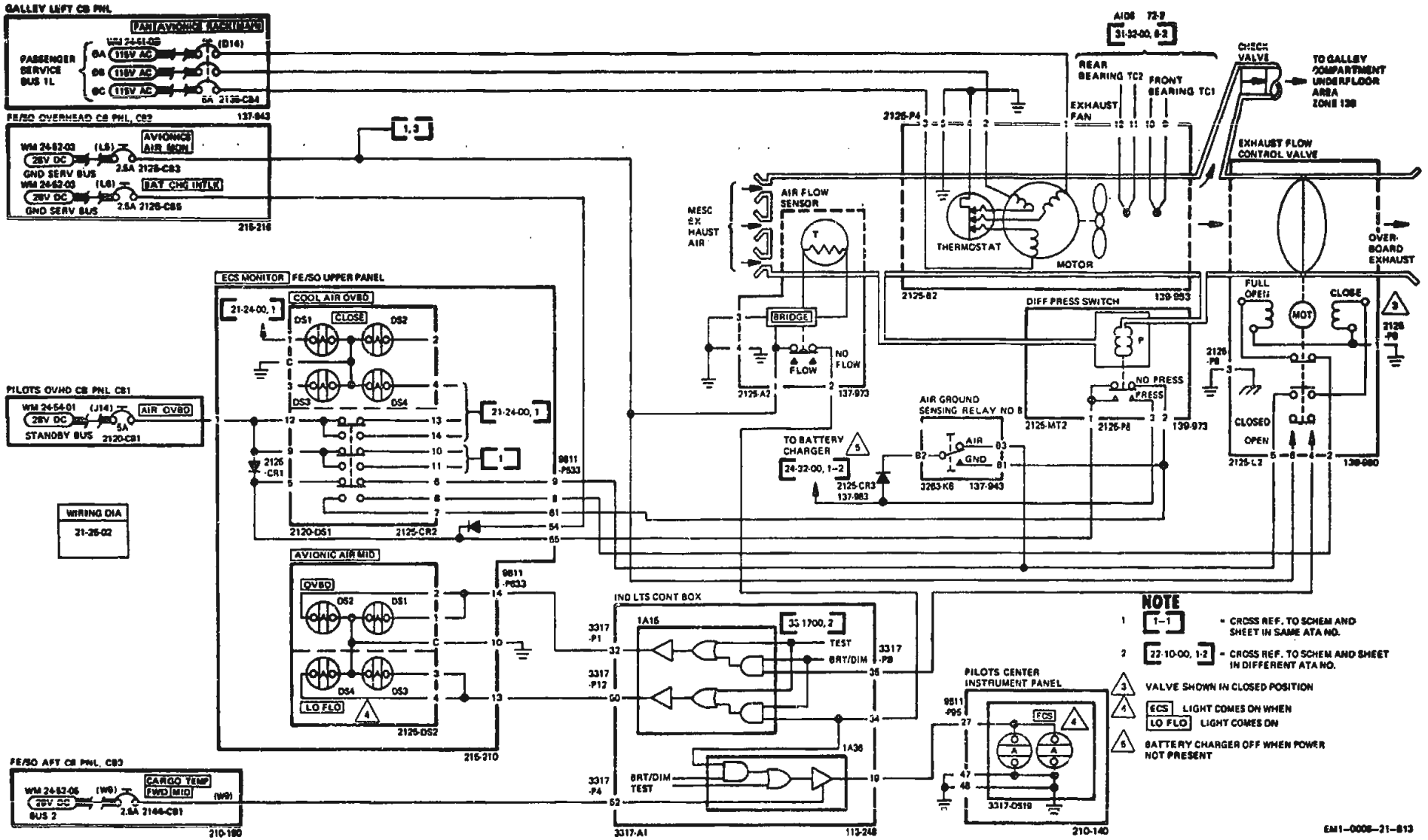
Instrument Cooling Problems
Figure 106 (Sheet 2)



R FESC Schematic
R SCHEM 1

EFFECTIVITY: ALL

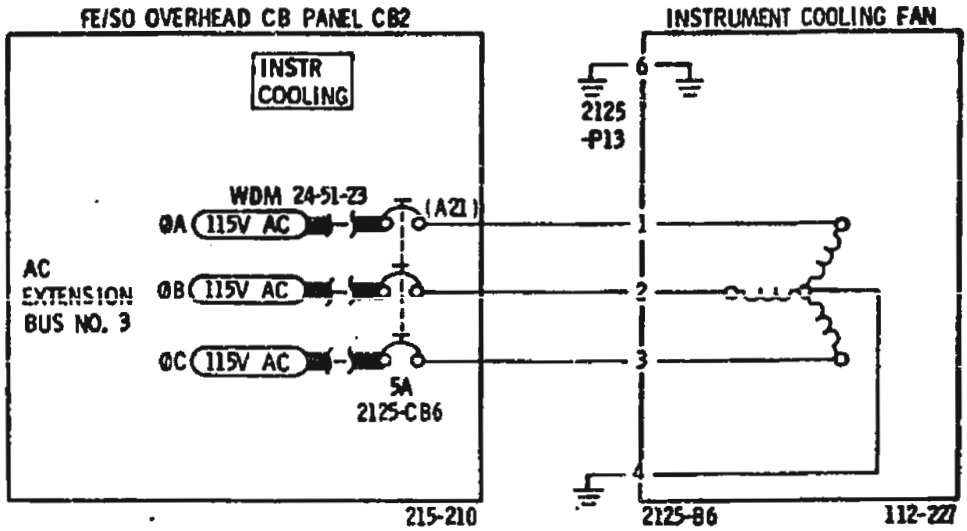
001B



R MESC Cooling System Schematic
R SCHEM 2

EFFECTIVITY: 001-023

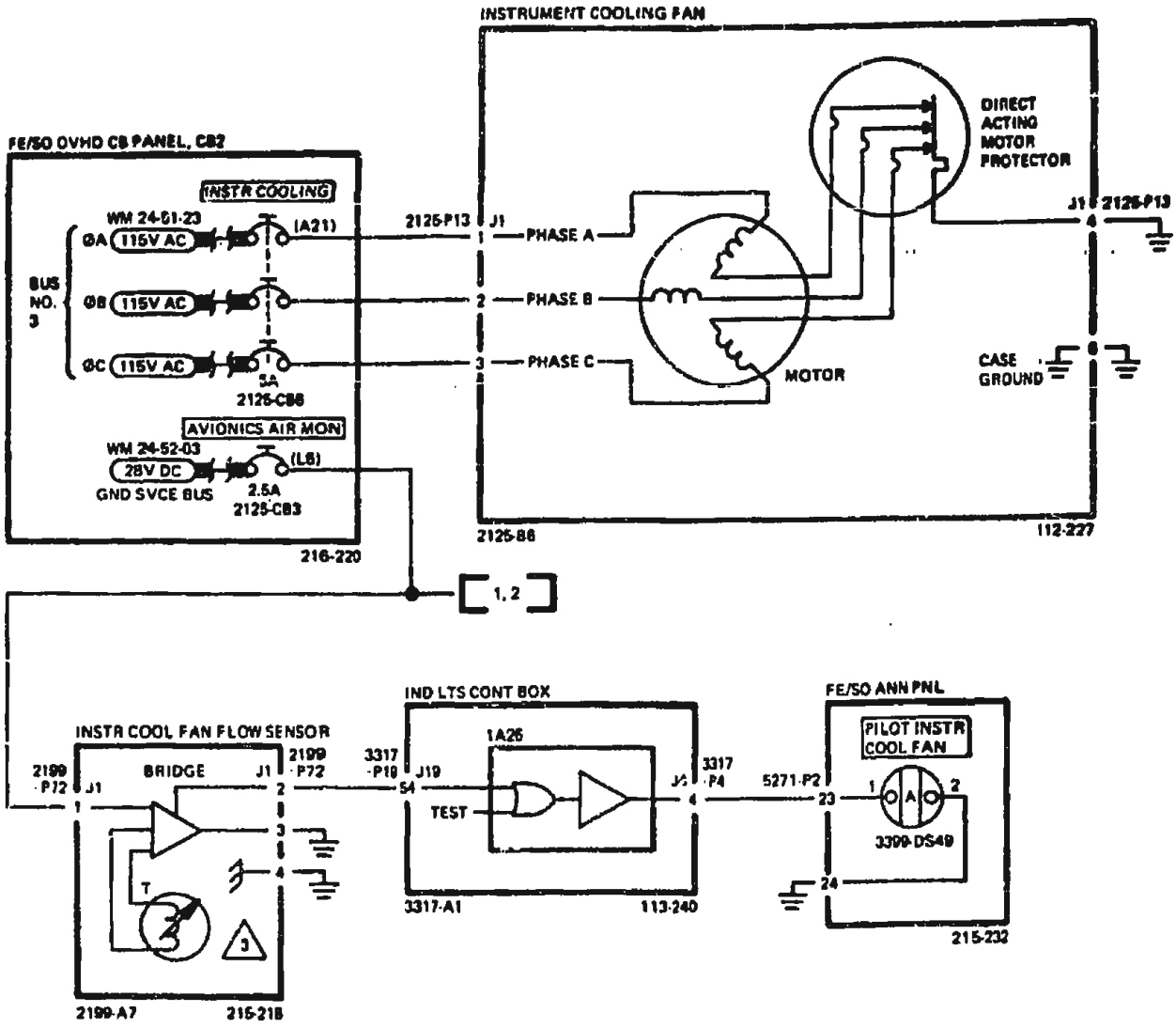
0018



EM1-0000-21-1000

Instrument Cooling System Schematic
SCHEM 3

R EFFECTIVITY: 001-031 WITHOUT SB21-123 OR
R WITH SB21-143
001B



NOTE

1 [1] - CROSS REF. TO SCHEM IN SAME ATA NO.

2 [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.

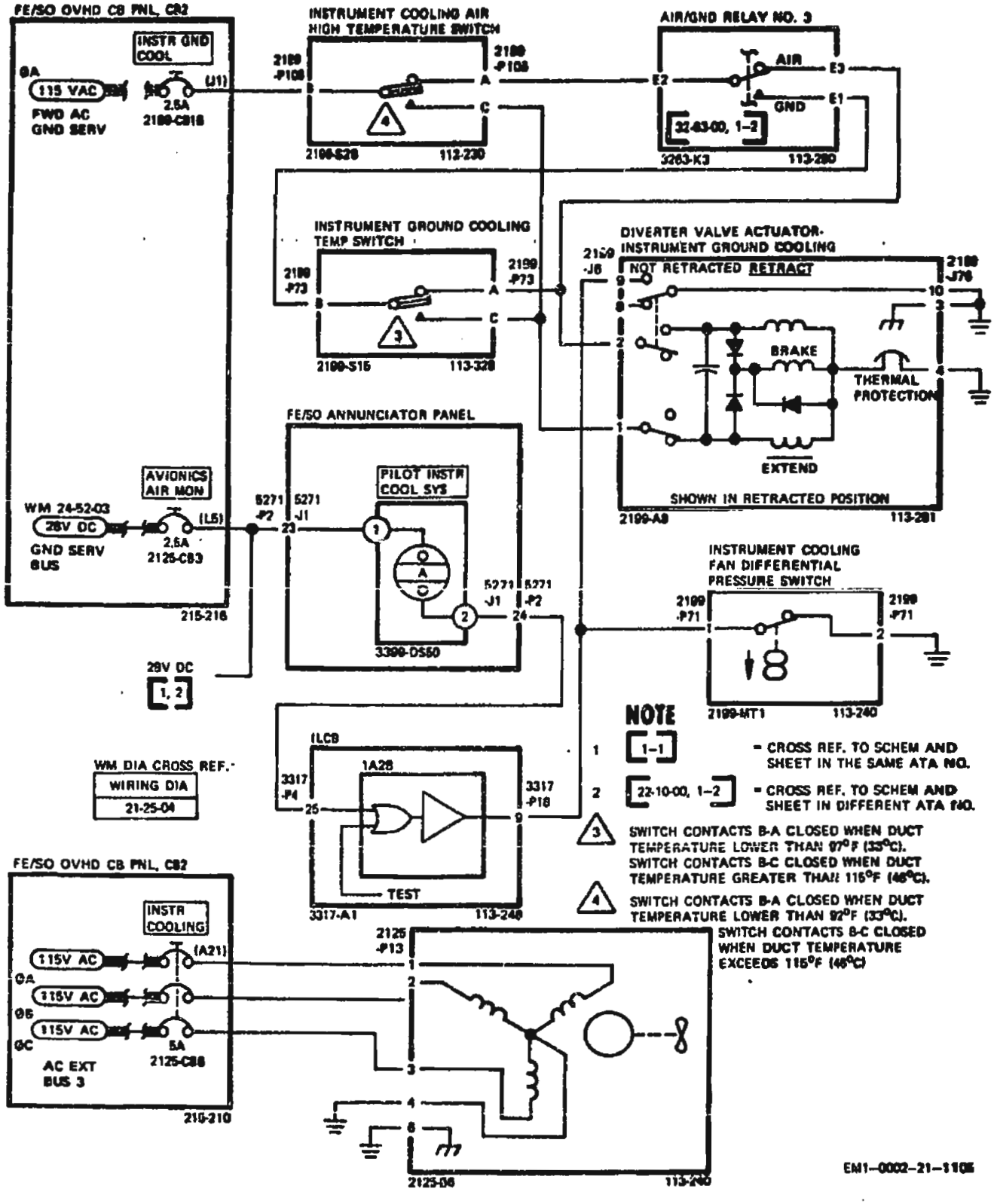
3 IF AIR FLOW CEASES, HEAT IS NOT DISIPATED IN THERMISTOR AND TEMPERATURE INCREASE. RESISTANCE CHANGES BALANCE IN BRIDGE WHICH SWITCHES TO ALLOW 28V DC TO PIN 2

WM DIA CROSS REF.

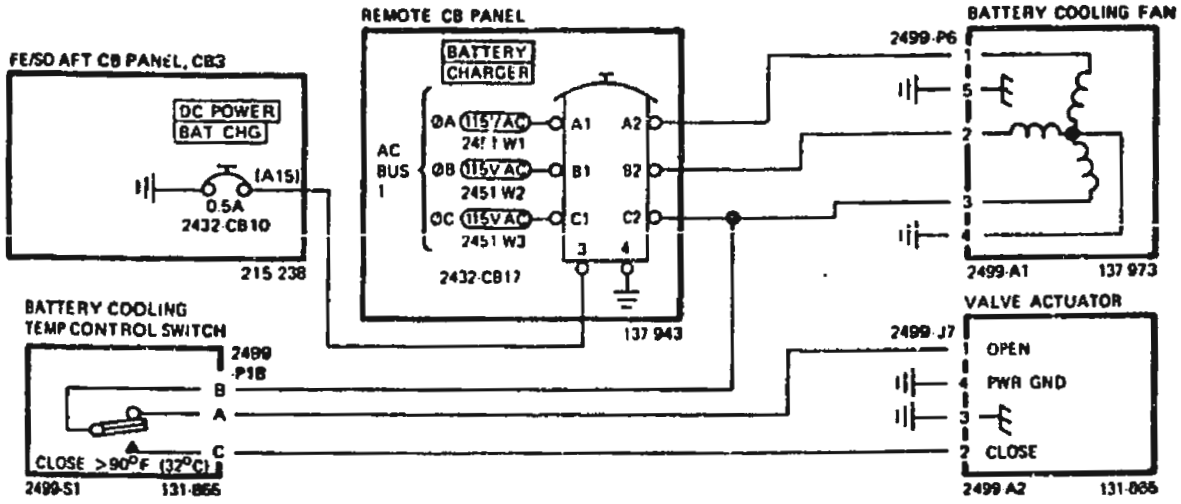
WIRING DIA
21-25-04

EM1-0000-21-5???

Instrument Cooling System Schematic
SCHEM 3



Instrument Cooling System Schematic
SCHEM 3



NOTE

1 [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.

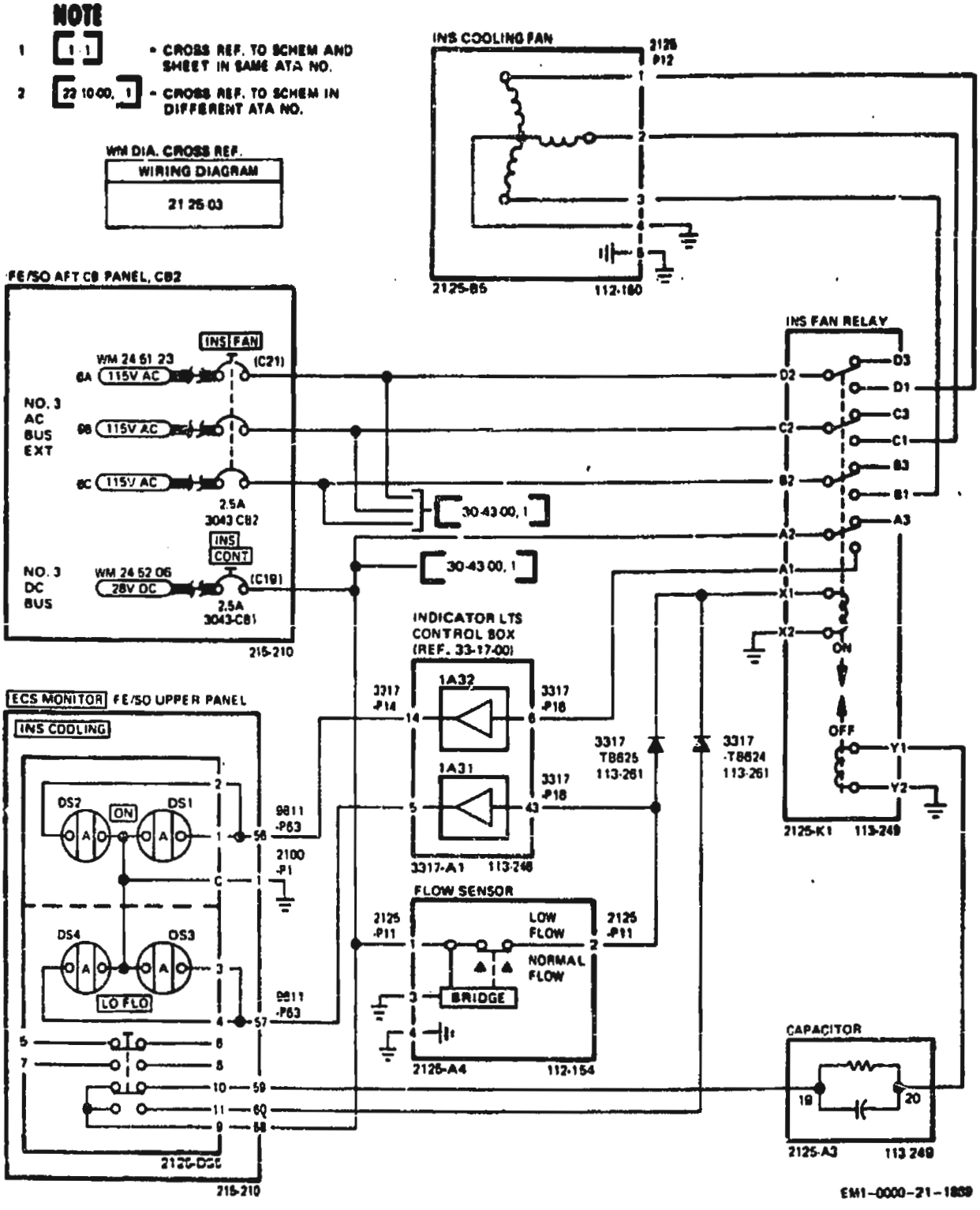
2 [22-10-00, 1-2] • CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.

WM DIA CROSS REF.
WIRING DIAGRAM
24-32-03

EM1-0001-21-612

Battery Cooling System Schematic
SCHEM 4

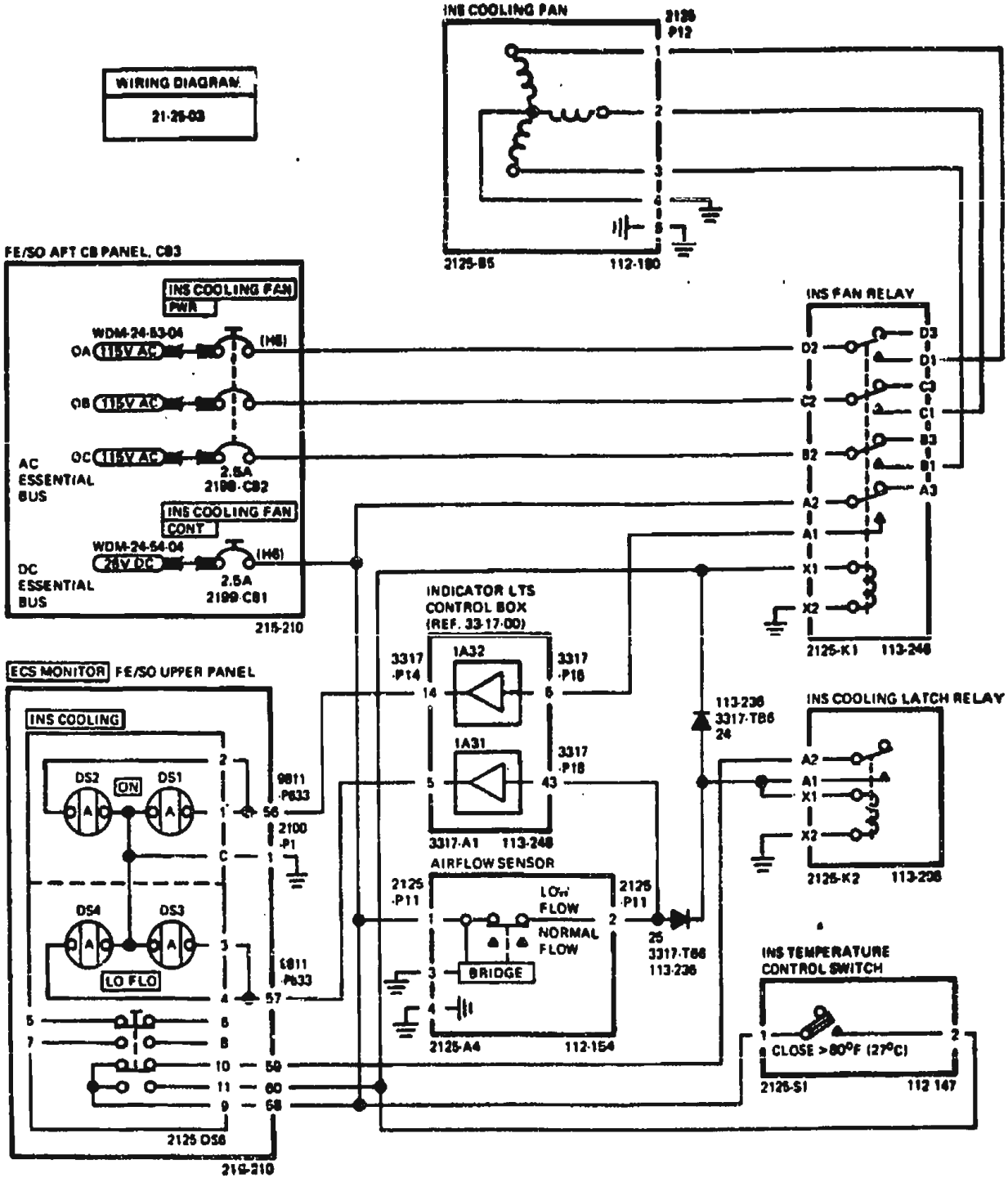
R EFFECTIVITY: ALL
R
001B



C
C

INS Cooling System Schematic
SCHEM 5

R EFFECTIVITY: 018-031
R
001B



EM1-0001-21-1762

INS Cooling System Schematic
SCHEM 5

ELECTRONIC AND ELECTRICAL EQUIPMENT COOLING SYSTEM SERVICING

1. General

On aircraft 001-020 with SB21-050 and 001-031 without SB21-143, the flight station instrument cooling fan draws cooling air from the flight station through a screened inlet grille in the Flight Engineer/Second Officer (FE/SO) kickpanel. Excessive lint in the inlet screen can result in inadequate cooling of flight station instruments.

On aircraft 001-031 with SB21-143, the FESC cooling fan draws air from the flight station through a screened inlet grille in the FE/SO kikpanel. Excessive lint in the inlet screen has no direct effect on proper operation of the FESC cooling system. However, the screen should be kept clean to prevent excessive lint from accumulating in the FESC ducting and below the forward cargo compartment floor.

2. Equipment and Materials

Portable vacuum cleaner

Detergent soap powder

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Servicing

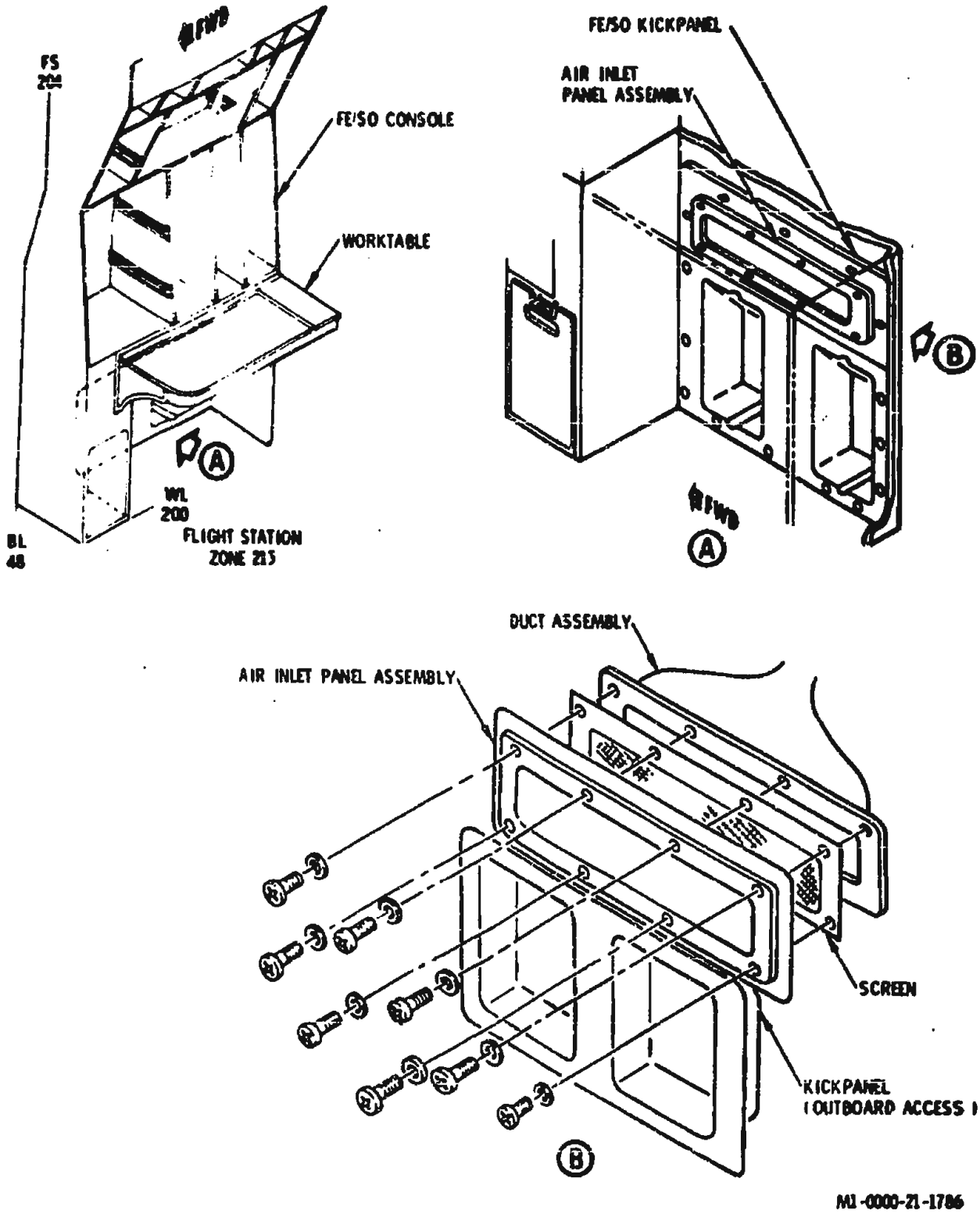
A. Cleaning Inlet Screen

(1) On FE/SO ELECTRICAL panel, select GND SERVICE bus for electrical power (Ref. 24-00-00).

(2) Clean screen with vacuum cleaner.

(3) If screen is coated with nicotine debris; remove screen, wash in soap and water, dry and re-install (Ref. Fig. 301).

(4) Close circuit breaker opened in Step 4A(1).



Air Inlet Screen
Servicing
Figure 301

ELECTRONIC AND ELECTRICAL SERVICE CENTERS COOLING SYSTEM SERVICING

1. General

A removable foam filter which can be cleaned and reinstalled, covers the air inlet in the kickpanel below the Flight Engineer/Second Officer (FE/SO) worktable.

The filter prevents lint and dust from accumulating in the FESC cooling system ducting and below the forward cargo compartment floor.

NOTE: The slot in the filter retainer frame must be aft to provide adequate air flow for the Flight Station zone temperature control sensor (Ref. 21-61-00). A direction arrow points aft to help prevent improper installation.

2. Equipment and Materials

Detergent soap powder

Portable vacuum cleaner

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Servicing

A. Cleaning Inlet Filter

(1) Remove foam filter from the frame by removing four corner screws attaching filter to the frame (Ref. Fig. 301).

(2) Wash filter in a solution of detergent soap and water.

(3) Rinse filter with water and air dry.

R (4) Inspect for litnt over the inlet screen, and clean if necessary. If inlet screen does not need cleaning, install filter over the inlet with four attaching screws removed in Step 4A(1).

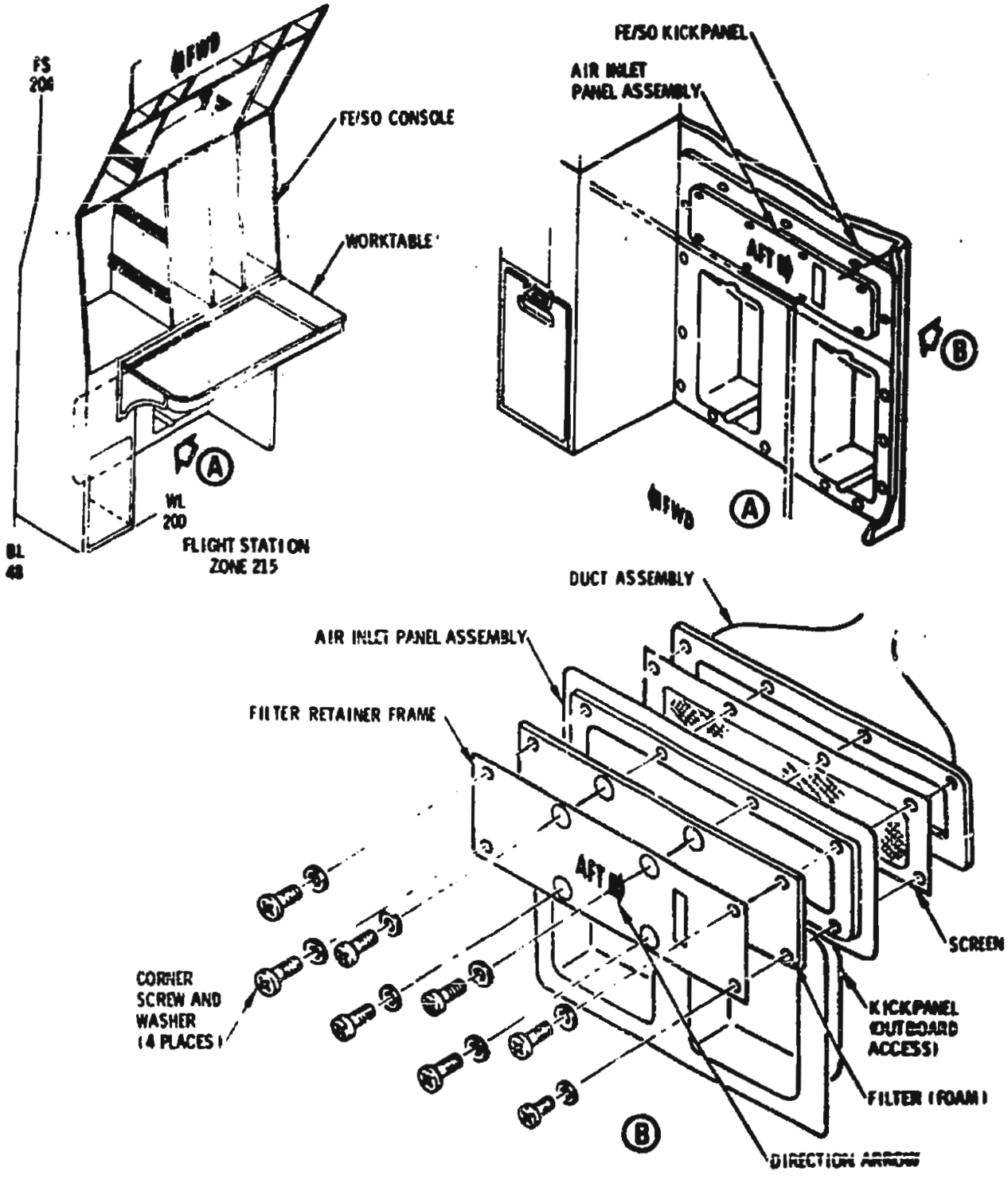
B. Cleaning Inlet Screen

R (1) On FE/SO ELECTRICAL panel, select GND SERVICE bus for
R electrical power (Ref. 24-00-00).

(2) Clean screen with vacuum cleaner.

(3) If screen is coated with nicotine debris; remove screen, wash in soap and water, dry and re-install.

(4) Install filter over the inlet with four attaching
R screws removed in Step 4A(1).



R Air Inlet Filter/Screen
R Servicing
R Figure 301

R EFFECTIVITY: 032-999

ELECTRONIC AND ELECTRICAL EQUIPMENT COOLING SYSTEMS ADJUSTMENT AND TEST

1. General

R On aircraft 001-031,
R the forward electronic service center (FESC), instrument, mid
R electrical service center (MESC) and battery cooling systems
R have no adjustable components.

R On aircraft 032-999,
R the forward electronic service center (FESC), inertial
R navigation system (INS), instrument, mid electrical service
R center (MESC) and battery cooling systems have no adjustable
R components.

R The following procedures are operational tests of the electrical
R components in each system. If the tests are not completed
R successfully, fault isolate the respective system (Ref.
R 21-25-00) and replace faulty component(s).

R Each system may be tested separately by first performing the
R preliminary test (Ref. Step 4) and then the applicable
R operational test(s) (Ref. Step 5).

R FESC and Instrument Cooling Systems (Ref. Step 5A)

R On aircraft 032-999,
R INS Cooling System (Ref. Step 5B)

R MESC Cooling System (Ref. Step 5C)

R Battery Cooling System (Ref. Step 5D)

R Door Actuator - Battery Cooling System (Ref. Step 5E)

2. Referenced Procedures

21-25-00	Electronic and Electrical Service Center Exhaust Systems - Fault Isolation
24-00-00	Electrical Power - Maintenance Practices
24-41-00	External Power - Maintenance Practices
24-32-00	Standby Power System - Description and Operation

32-63-00 Air/Ground Sensing System - Adjustment and Test

33-17-00 Annunciator System - Adjustment and Test

3. Equipment and Materials

Heat gun

Freon

R 4. Preliminary Test

R A. On the following circuit breaker panels, verify the listed
R circuit breakers are closed:

R (1) Pilots overhead circuit breaker panel CB1, zone 210

R AIR - OVBD (J14)

R (2) Flight Engineer/Second Officers overhead circuit
R breaker panel CB2, zone 215

R AVIONICS - AIR - MON (L5)

R BAT - CHG - INTLK (L6)

R INSTR - COOLING (A21)

R (3) Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215

R BAT - CHG (A15)

R CARGO TEMP - FWD/MID (W9)

R On aircraft 032-999,
R INS COOLING FAN - CONT (H6), - PWR (H8)

R (4) Galley left circuit breaker panel, zone 130

R FAN - AVIONICS - RACK - MAIN (D14)

R (5) Galley right circuit breaker panel, zone 130

R FWD AVIONICS - FAN (E14)

R B. Turn on electrical power (Ref. 24-00-00).

R C. Verify annunciator system (advisory lights) is operational
(Ref. 33-17-00). If ECS annunciator light in pilots

instrument panel is on, reset annunciator system. ECS legend must go off.

R 5. Operational Test

R A. FESC and Instrument Cooling Systems

R (1) On Flight Engineer/Second Officers ECS MONITOR panel, R zone 215, depress COOL AIR OVBD switchlight to normal R (latched in) position.

R (2) Open FESC access door 112AB. In aft lower portion of R FESC, verify instrument cooling system fan is R operating.

R (3) Verify FESC exhaust fan is operating and exhaust R control valve is open. To verify, check for fan-driven R exhaust air flow from the approximately 6 by 8-inch R oval opening in the lower right forward fuselage, below R the flight station windows.

R (4) On Flight Engineer/Second Officers ECS MONITOR panel, R zone 215, verify the following:

R (a) COOL AIR OVBD switchlight: CLOSE legend off

R (b) AVIONIC AIR - FWD indicator light: OVBD legend R on, LO FLO legend off

R CAUTION: DO NOT ALLOW FESC EXHAUST CONTROL VALVE TO REMAIN R CLOSED OR EXHAUST FAN TO BE INOPERATIVE ANY LONGER R THAN REQUIRED FOR TEST. IF TEST TAKES LONGER THAN R 2 OR 3 MINUTES TURN AIRCRAFT POWER TO GROUND R SERVICE POWER (Ref. 24-41-00).

R (5) Place aircraft in simulated in-flight condition (Ref. R 32-63-00) and verify the following:

R (a) FESC exhaust control valve closes. To verify, R check that exhaust air is no longer flowing from R exhaust openings.

R (b) AVIONIC AIR - FWD indicator light: OVBD legend R off, LO FLO legend off

R (c) Pilots ECS annunciator light: ECS legend off

R (6) On galley right circuit breaker panel, zone 137, open circuit breaker FWD AVIONICS - FAN (14E) and verify the following:

(a) FESC exhaust fan stops

(b) FESC exhaust control valve opens

(c) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLO legend on

(d) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on

(7) Reset annunciator system. ECS legend must go off.

(8) Close circuit breaker opened in Step 5A(6), and verify the following:

(a) FESC exhaust fan operates

(b) FESC exhaust control valve closes

(c) AVIONIC AIR - FWD indicator light: OVBD legend off, LO FLO legend off

(d) Pilots ECS annunciator light: ECS legend off

(9) Return air/ground sensing system to normal on-ground condition (Ref. 32-63-00) and verify the following:

(a) FESC exhaust control valve opens

(b) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLO legend off

CR (c) Pilots ECS annunciator light: ECS legend OFF.

CR NOTE: Aircraft with ILCB 1A36 c/w card will flash
CR the ECS light for approximately 10 seconds,
CR then stay on.

CR (10) Reset annunciator system. ECS legend must go off, if
CR it was on.

(11) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, release COOL AIR OVBD switchlight to close (out) position and verify the following:

(a) FESC exhaust control valve closes

(b) COOL AIR OVBD switchlight: CLOSE legend on

(c) AVIONIC AIR - FWD indicator light: OVBD legend off, LO FLO legend off

(d) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on

(12) Reset annunciator system. ECS legend must go off.

(13) Depress COOL AIR OVBD switchlight to normal (latched in) position and verify the following:

(a) FESC exhaust control valve opens

(b) COOL AIR OVBD switchlight: CLOSE legend off

(c) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLO legend off

(14) Turn off electrical power (Ref. 24-00-00).

R B. INS Cooling System

(1) On FE/SO ECS MONITOR panel, release INS COOLING switchlight to the normal (out) position.

(2) Verify Forward Electronic Service Center (FESC) exhaust fan is operating and FESC exhaust flow control valve is open by checking for exhaust airflow from a 6 by 8-inch oval port in the lower right forward fuselage exterior, below the flight station windows.

(3) On FE/SO ECS MONITOR panel, verify the following:

(a) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLOW legend off.

(b) INS COOLING switchlight: ON legend off, LO FLO legend off.

R NOTE: On aircraft 032-999,
R if the temperature in the FESC is above the close setting of the INS temperature control switch (70-80°F), the INS cooling fan may already be on. If so, the switch must be cooled with Freon to perform test.

CAUTION: DO NOT ALLOW FESC EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN 5 MINUTES.

(4) On galley right circuit breaker panel, open circuit breaker FWD AVIONICS FAN (E14).

(5) Verify the following events occur in sequence:

(a) AVIONIC AIR - FWD indicator: LOW FLO legend on (FESC fan stopped).

(b) INS COOLING switchlight:

LO FLO legend on.

ON legend on (INS cooling fan on).

LO FLO legend off.

(6) On FE/SO aft circuit breaker panel CB3, open circuit breaker INS COOLING FAN - PWR (H8) and verify the following:

(a) INS COOLING switchlight: ON legend remains on, LO FLO legend on.

(7) On galley right circuit breaker panel, zone 131, close circuit breaker FWD AVIONICS FAN (E14).

(8) Verify the following:

(a) AVIONIC AIR - FWD indicator light: LO FLO legend off (FESC fan operating).

(b) INS COOLING switchlight: LO FLO legend off, ON legend remains on until INS COOLING switchlight is pressed (latched in) and then released (unlatched) at which time ON legend goes off.

(9) On FE/SO aft circuit breaker panel CB3, close breaker INS COOLING FAN - PWR (H8) and verify the following:

(a) INS COOLING switchlight: ON legend off, LO FLO legend off.

(b) INS cooling fan stopped.

(10) Apply heat with heat gun to INS temperature control switch and warm above 80°F.

(11) Verify the following events occur in sequence:

(a) INS Fan - operating

(b) INS COOLING switchlight: ON legend on, LO FLO legend off

(12) Press (latch in) INS COOLING switchlight and verify ON legend is on.

(13) Turn off electrical power (Ref. 24-00-00).

C. MESC Cooling System

(1) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, depress COOL AIR OVBD switchlight to normal (latched in) position.

(2) Verify MESC exhaust fan is operating and exhaust control valve is open. To verify, check for fan-driven exhaust air flow from the approximately 5 by 7-inch oval opening in the left forward wing-to-fuselage fairing.

(3) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, verify the following:

(a) COOL AIR OVBD switchlight: CLOSE legend off

(b) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend off

CAUTION: DO NOT ALLOW MESC EXHAUST CONTROL VALVE TO REMAIN CLOSED OR EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN REQUIRED FOR TEST. IF TEST TAKES LONGER THAN 2 OR 3 MINUTES TURN AIRCRAFT POWER TO GROUND SERVICE POWER (Ref. 24-41-00).

(4) Place aircraft in simulated in-flight condition (Ref. 32-63-00) and verify the following:

(a) MESC exhaust control valve closes. To verify, check that exhaust air is no longer flowing from exhaust opening.

(b) AVIONIC AIR - MID indicator light: OVBD legend off, LO FLO legend off

(c) Pilots ECS annunciator light: ECS legend off

(5) On galley left circuit breaker panel, open circuit breaker FAN - AVIONICS - RACK - MAIN (D14) and verify the following:

(a) MESC exhaust fan stops

(b) MESC exhaust control valve opens

(c) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend on

(d) Pilots annunciator light: ECS legend flashes for approximately 10 seconds, then remains on

(e) Battery charger is not operating (Ref. 24-32-00)

(6) Reset annunciator system. ECS legend must go off.

(7) Close circuit breaker opened in Step 5C(5) and verify the following:

(a) MESC exhaust fan operates

(b) MESC exhaust control valve closes

(c) AVIONIC AIR - MID indicator light: OVBD legend off, LO FLO legend off

(d) Pilots annunciator light: ECS legend off

(e) Battery charger operates (Ref. 24-32-00)

(8) Return air/ground sensing system to normal on-ground condition (Ref. 32-63-00) and verify the following:

(a) MESC exhaust control valve opens

(b) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend off

(9) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, release COOL AIR OVBD switchlight to close (out) position and verify the following:

(a) MESC exhaust control valve closes

(b) COOL AIR OVBD switchlight: CLOSE legend on

(c) AVIONIC AIR - MID indicator light: OVBD legend off, LO FLO legend off

(d) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on

(10) Reset annunciator system. ECS legend must go off.

(11) Depress COOL AIR OVBD switchlight to normal (latched in) position and verify the following:

(a) MESC exhaust control valve opens

(b) COOL AIR OVBD switchlight: CLOSE legend off

(c) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend off

(12) Turn off electrical power (Ref. 24-00-00).

D. Battery Cooling System

(1) In MESC, verify battery cooling fan is operating and air is flowing from louvers on battery (air flow is low velocity).

(2) On galley ceiling, verify valve actuator air duct cover is in open position, cooling air flowing to battery.

(3) Increase air cooling temperature to approximately 94°F (35°C) by using heat gun near thermal switch or ECS control and verify that the valve actuator air duct cover moves to closed position.

(4) Verify that galley air is drawing into the air outlet plenum through ducting by fan operation to the battery.

(5) Remove heat source, turn off heat gun or ECS Control and allow thermal switch to cool (shop air supply) to normal temperature approximately 70°F (21°C).

(6) Verify valve actuator air duct cover moves to open position when thermal switch cools below 86°F (30°C).

(7) Turn off cool air supply (Ref. 20-00-00).

(8) Turn off electrical power (Ref. 24-00-00).

C E. Operational Test - Door Actuator - Battery Cooling System

C (1) Turn on electrical power, (Ref. 24-00-00)

C (2) On Flight Engineer/Second Officer aft circuit breaker
C panel CB3, zone 215, close circuit breaker BAT-CHG
C (A15).

C (3) Remove galley ceiling access panels 135HL and 135JL,
C (Ref. 6-50-00)

C (4) Locate thermal switch above the galley/battery cooling
C supply air duct and remove electrical connector from
C switch.

C (5) Check for operation of actuator with jumper between
C connector pins as follows:

C (a) Pin B to C - Rod Retracts

C (b) Pin B to A - Rod Extends

C CAUTION: 115VAC IS PRESENT ON PIN B AS LONG AS CIRCUIT
C BREAKER IN STEP (2) IS CLOSED.

C (6) Return aricraft to normal

C (7) Remove electrical power.

FORWARD ELECTRONIC SERVICE CENTER EXHAUST AIR FLOW SENSOR MAINTENANCE PRACTICES

1. General

The forward electronic service center exhaust air flow sensor is located in the aft right side of the forward electronic service center, zone 112. Access is through access door 112AB.

2. Maintenance Practices

A. Deactivation

(1) On Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS - AIR - MON (L5).

(2) Open access door 112AB.

(3) In right aft section of forward electronic service center, zone 112, remove electrical cable connector from FESC exhaust air flow sensor. Install jumper from pin 1 to pin 2 of cable connector (to simulate "no pressure" condition).

(4) Install protective cap on sensor receptacle.

(5) Stow electrical cable connector, with jumper install, for flight.

(6) On Flight Engineer/Second Officers ECS MONITOR panel placard AVIONICS AIR FWD switchlight FORWARD ELECTRONIC SERVICE CENTER EXHAUST AIR FLOW SENSOR INOPERATIVE.

(7) Close circuit breaker L5 on CB2 opened in Step 2A(1) and remove tag.

(8) Make appropriate entry in aircraft log book.

FORWARD ELECTRONIC SERVICE CENTER (FESC) EXHAUST AIR FLOW SENSOR REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

Protective plug (sensor boss)

O-ring, MS9385-04, or equivalent

2. Referenced Procedure

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS AIR MON (L5).

(2) Disconnect electrical connector from sensor (Ref. Fig. 401).

(3) Install protective caps on connector and sensor receptacle.

(4) On aircraft without SB21-205, using wrench on wrench flats, remove sensor and o-ring from duct and discard o-ring.

(4) On aircraft with SB21-205, using a wrench to hold adapter, remove sensor and o-ring from duct, discard o-ring (Ref. Fig. 401).

R (5) Install protective plug in sensor boss if new sensor is not going to be installed immediately.

B. Installation

(1) Verify circuit breaker opened in Step 3A(1) is open and tagged.

(2) Remove protective plug from sensor boss, if installed.

(3) Install new o-ring on sensor and using wrench on wrench flats, install sensor into duct (Ref. Fig. 401).

(4) Remove protective caps and connect electrical connector to sensor.

(5) Remove tag and close circuit breaker opened in Step 3A(1).

CAUTION: DO NOT KEEP FULL SERVICE ELECTRICAL POWER APPLIED TO AIRCRAFT WITH EXHAUST FAN INOPERATIVE. EQUIPMENT OVERHEATING CAN DAMAGE COMPONENTS AND CAUSE ELECTRICAL FIRES.

(6) On FE/SO ELECTRICAL panel, zone 215, select GND SERVICE for aircraft electrical power (Ref. 24-41-00).

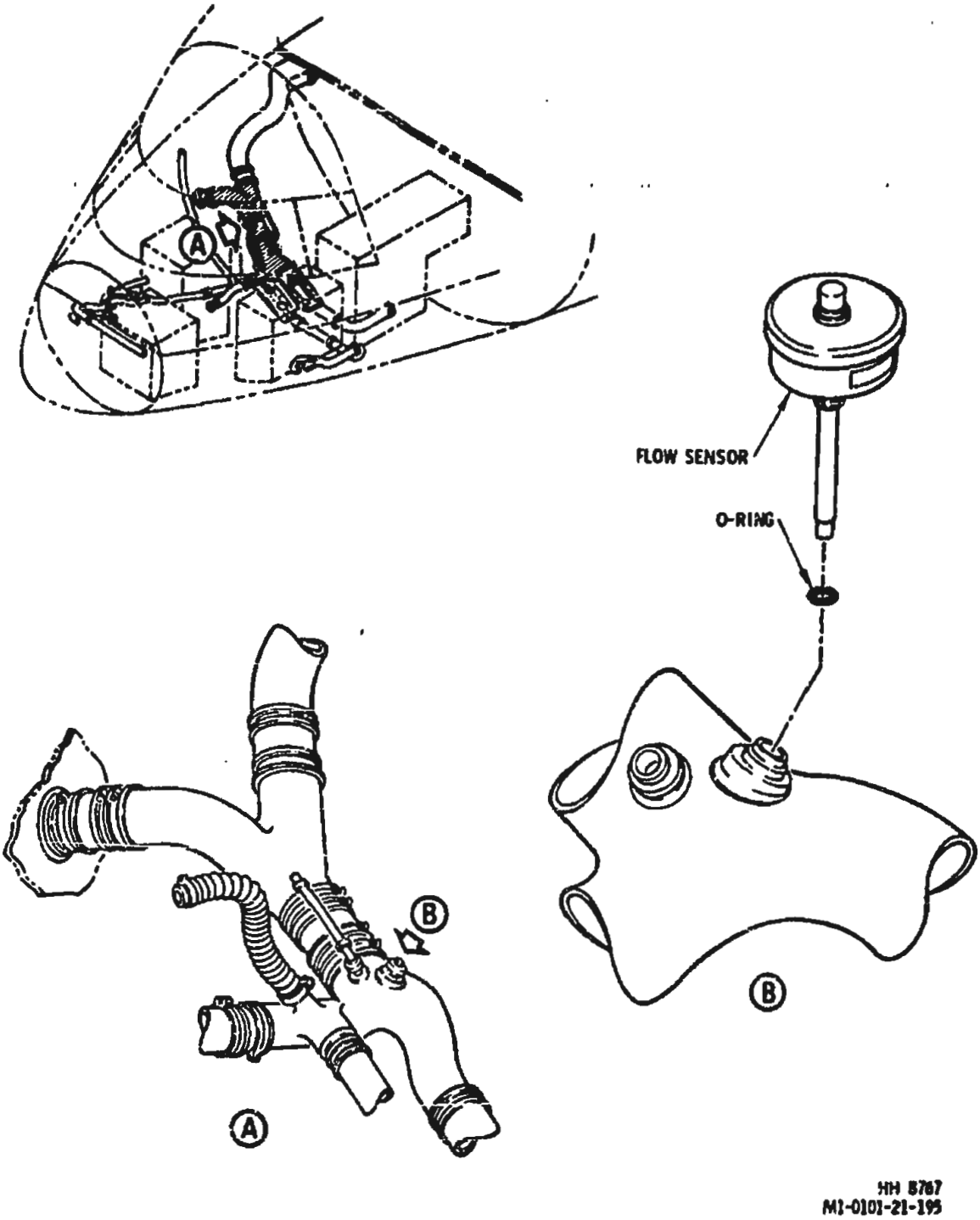
(7) On galley right circuit breaker panel, zone 137, open circuit breaker FWD AVIONICS - FAN (E14).

(8) With FESC exhaust fan stopped, verify the following:

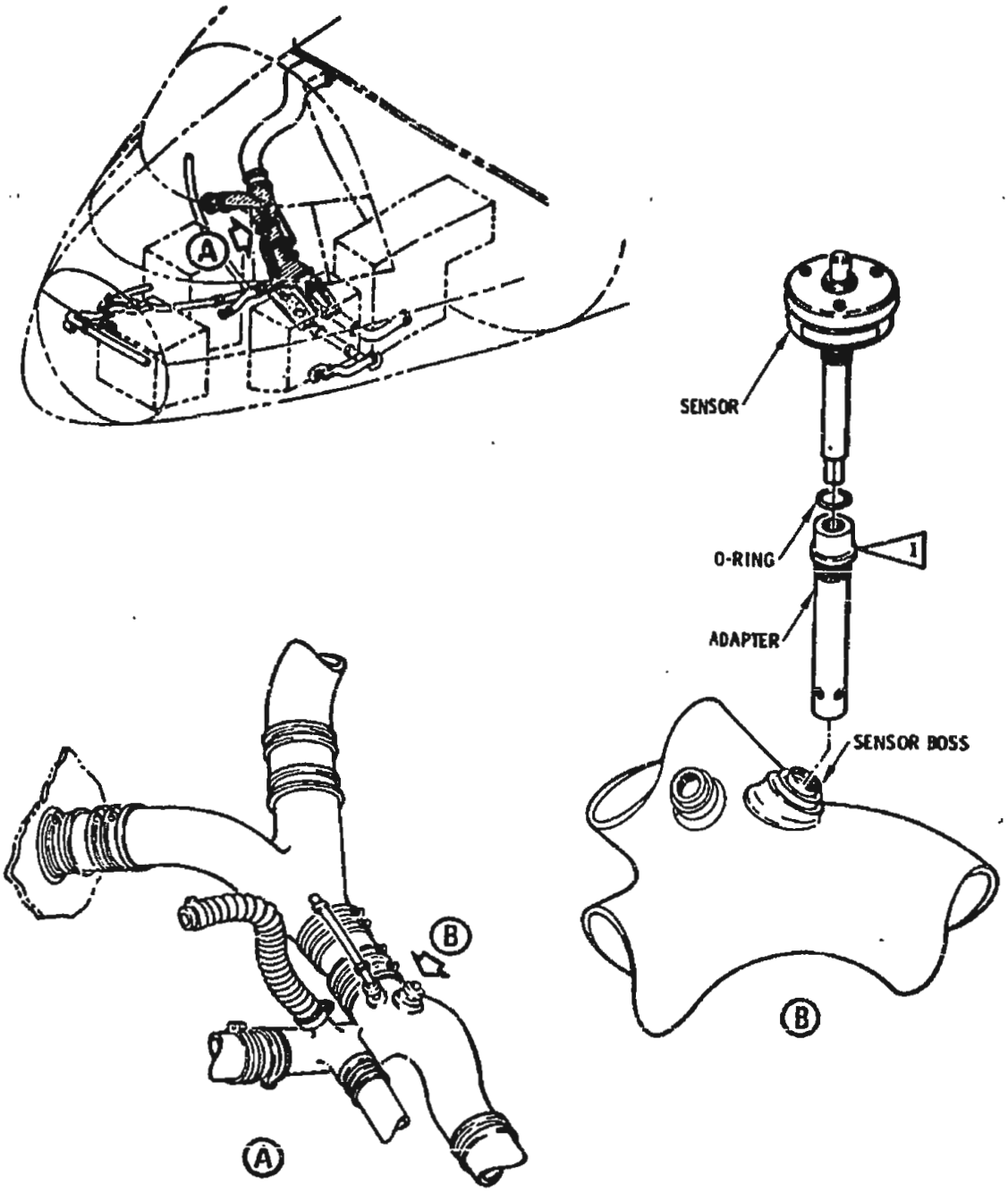
(a) On FE/SO ECS MONITOR panel, verify OVBD and LO FLO legends in AVIONIC AIR - FWD indicator light are on.

(b) Remove tag and close circuit breaker opened in Step 2B(6) and verify FESC exhaust fan is operating.

(c) With fan running, LO FLO legend in AVIONIC AIR - FWD indicator light must go off and OVBD legend must remain on.



Forward Electronic Service Center Exhaust Air Flow Sensor
Removal and Installation
Figure 401.



NOTE
1 ON AIRCRAFT WITH SB 21-205

M1-0000-21-2153

R Forward Electronic Service Exhaust Air Flow Sensor
R Removal and Installation
R Figure 401

R EFFECTIVITY: ON AIRCRAFT WITH SB21-205

0019

FORWARD ELECTRONIC SERVICE CENTER (FESC) EXHAUST AIR FLOW SENSOR ADJUSTMENT AND TEST

1. General

The FESC Exhaust Air Flow Sensor detects duct blockage, fan failure on the ground, or fan failure and failure of the exhaust flow control valve to open in flight. Insufficient airflow detected by the flow sensor illuminates the LO FLO legend in the AVIONIC AIR - FWD indicator and the ECS annunciator on the pilots caution and warning panel.

The flow sensor is a nonadjustable and nonrepairable item. The sensor when suspected of malfunctioning, should be replaced and sent to the shop for a complete test. The following procedure will provide a go/no-go indication of satisfactory operation in the aircraft.

2. Referenced Procedures

R 21-25-01 FESC Exhaust Air Flow Sensor - Removal and Installation

21-25-01 FESC Exhaust Air Flow Sensor - Cleaning and Painting

3. Adjustment/Test

A. Operational Test

(1) On Flight Engineer/Second Officer (FE/SO) ECS MONITOR panel, zone 215, verify that OVBD legend in AVIONIC AIR - FWD indicator light is on and that LO FLO legend is off.

(2) Station observer in flight station to monitor AVIONIC AIR - FWD indicator light.

R CAUTION: DO NOT KEEP FULL SERVICE ELECTRICAL POWER APPLIED TO AIRCRAFT WITH EXHAUST FAN INOPERATIVE. EQUIPMENT OVERHEATING CAN DAMAGE COMPONENTS AND CAUSE ELECTRICAL FIRES.

(3) On galley right circuit breaker panel, zone 130, open circuit breaker FWD AVIONICS - FAN (E14).

R (4) Verify LO FLO light comes on within 40 seconds.

R NOTE: If LO FLO light does not come on within 40
R seconds, close circuit breaker, remove sensor,
R and clean (Ref. 21-25-01). Reinstall sensor and
R repeat test. If LO FLO light is still not on
R within 40 seconds, replace sensor.

R (5) As soon as LO FLO light comes on, close FWD AVIONICS -
R FAN circuit breaker.

R (6) Verify LO FLO light goes off within 40 seconds.

R NOTE: If LO FLO light is not off within 40 seconds,
R remove sensor and clean (Ref. 21-25-01).
R Reinstall sensor and repeat test. If LO FLO
R light is still no off within 40 seconds, replace
R sensor.

R FORWARD ELECTRONIC SERVICE CENTER (FESC) EXHAUST AIR FLOW SENSOR CLEANING AND PAINTING

1. Equipment and Materials

Solvent, Fed Spec P-S-661, or equivalent

Soft bristle brush

2. Referenced Procedure

R 21-25-01 FESC Exhaust Air Flow Sensor - Removal and Installation

3. Cleaning/Painting

A. Cleaning

R (1) Using wrench on wrench flats, remove sensor from duct
R (Ref. 21-25-01 - Removal).

R WARNING: DO NOT USE COMPRESSED AIR IN EXCESS OF 10 PSIG.
R WEAR PROTECTIVE GOGGLES WHILE USING COMPRESSED
R AIR. FAILURE TO COMPLY MAY RESULT IN EYE INJURY.

R CAUTION: THE SENSOR ELEMENT IS FRAGILE. BE CAREFUL NOT TO DAMAGE ELEMENT WHILE CLEANING.

(2) Brush collected dirt out of element cage on end of sensor with soft-bristle brush, or blow sensor clean with compressed air at not more than 10 psi pressure.

WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN OR
R EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR
R SKIN OR EYE IRRITATION.

(3) Wipe sensor stem with a soft rag moistened with solvent.

R (4) Using wrench on wrench flats, reinstall sensor in duct
R (Ref. 21-25-01 - Installation).

B. Painting

NOTE: No painting procedure is provided.

R # MID ELECTRICAL SERVICE CENTER EXHAUST AIRFLOW SENSOR MAINTENANCE PRACTICES

1. General

R The Mid Electrical Service Center Exhaust Airflow Sensor detects
R duct blockage, fan failure on the ground, or fan failure and
R failure of the exhaust flow control valve to open in flight.
R Insufficient air flow detected by the airflow sensor will
R illuminate the LO FLO legend in the AVIONIC AIR MID indicator
R and the ECS annunciator on the pilots caution and warning panel.

R NOTE: The MESC Exhaust Airflow Sensor may be inoperative
R provided the following are operative (Ref. Fig. 201):

R MESC exhaust fan (MM 21-25-04)

R MESC exhaust fan differential pressure switch (MM
R 21-25-06)

R MESC exhaust flow control valve (MM 21-25-10)

2. Equipment and Materials

Protective Caps

Jumper Plug (made from PN LS10215R10-5SN plug connecting pins 1, 2 and 3)

Contact Insertion/Removal Tool PN L525C19 or equivalent

3. Referenced Procedures

MM 24-00-00	Electrical Power System - Maintenance Practices
MM 24-32-00	Standby PowerSystem - Adjustment and Test
MM 21-25-04	Figure 201

4. Deactivation

A. On pilots overhead circuit breaker panel CB1, zone 210, open
R and tag circuit breaker AIR - OVBD (J14).

R B. On Flight Engineer/Second Officer (FE/SO) overhead circuit
R breaker panel CB2, zone 215, open and tag circuit breaker
R BAT - CHG - INTLK (L6).

R C. On FE/SO aft circuit breaker panel CB3, zone 215, open and tag circuit breaker BAT - CHG (A15).

R D. Locate fan differential pressure switch on aft left side of
R Mid Electrical Service Center, zone 137, remove electrical
R connector (Ref. MM 21-25-04, Fig. 201) and install jumper plug connecting pins 1, 2 and 3 of cable connector (to simulate fan pressure actuated switch), and stow connector for flight.

E. Disconnect, cap and stow wire from AIR/GND SENSING RELAY No. 8, relay socket pin B3 (Ref. MM 21-25-04, Fig. 201) to prevent valve from automatically closing after takeoff.

F. Remove tags and close circuit breakers opened in Steps 4A, 4B, and 4C.

G. Turn on electrical power (Ref. MM 24-00-00).

H. Verify battery charger is operative (Ref. MM 24-32-00).

R I. On FE/SO ECS MONITOR panel, placard AVIONIC AIR - MID
R indicator light MESC EXHAUST AIRFLOW SENSOR INOPERATIVE.

J. Make appropriate entry in aircraft log book.

R MID_ELECTRICAL_SERVICE_CENTER_(MESC)_EXHAUST_AIR_FLOW_SENSOR
R REMOVAL_AND_INSTALLATION

R 1. Equipment_and_Materials

R Protective caps (electrical connector)

R Protective plug (sensor boss)

O-ring, MS9385-04, or equivalent

R 2. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS - AIR - MON (L5).

R (2) Disconnect electrical connector from sensor (Ref. Fig.
R 401).

R (3) Install protective caps on connector and sensor
R receptacle.

R (4) Using wrench on wrench flats, remove sensor and O-ring
R from duct and discard O-ring.

R (5) Install protective plug in sensor boss if new sensor is
R not going to be installed immediately.

B. Installation

R (1) Verify circuit breaker opened in Step 2A(1) is open and
R tagged.

R (2) Remove protective plug from sensor boss, if installed.

R (3) Install new O-ring on sensor and using wrench on wrench
R flats, install sensor into duct (Ref. Fig. 401).

R (4) Remove protective caps and connect electrical connector
R to sensor.

R (5) Remove tag and close circuit breaker opened in Step
R 2A(1).

R CAUTION: DO NOT KEEP ELECTRICAL POWER APPLIED TO AIRCRAFT
R WITH EXHAUST FAN INOPERATIVE. EQUIPMENT
R OVERHEATING CAN DAMAGE COMPONENTS AND CAUSE
R ELECTRICAL FIRES. MESC EXHAUST FAN ALSO EXHAUSTS
R HYDROGEN GAS GIVEN OFF BY AIRCRAFT BATTERY.

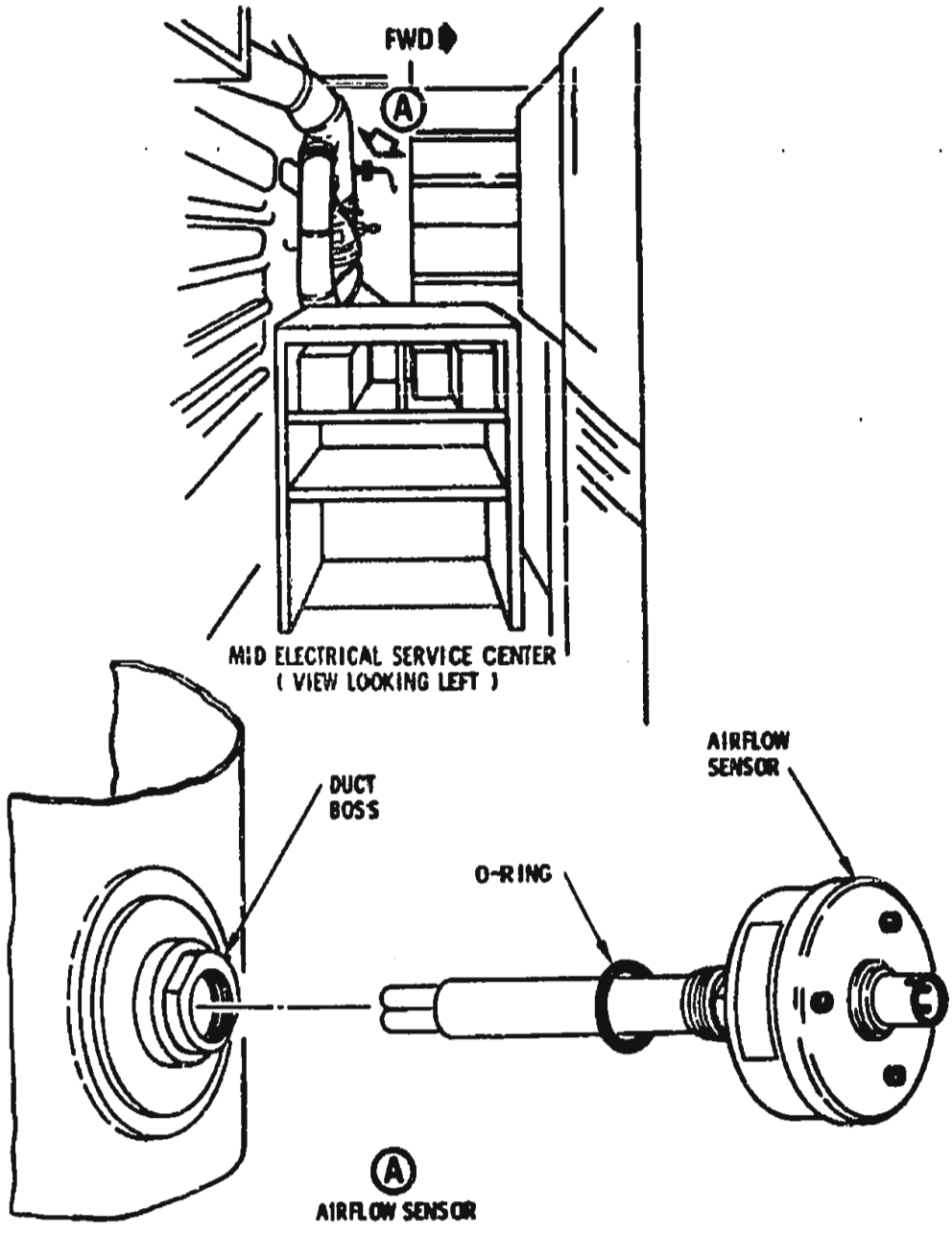
(6) On galley left circuit breaker panel, zone 137, open and tag circuit breaker FAN - AVIONICS RACK - MAIN
R (D14).

R (7) With MESC exhaust fan stopped, verify the following:

(a) On FE/SO ECS MONITOR panel, zone 215, verify OVBD
R and LO FLO legends in AVIONIC AIR - MID indicator
R light are on.

R (b) Remove tag and close circuit breaker opened in
R Step 2B(6) and verify MESC exhaust fan is
R operating.

R (c) With fan running, LO FLO legend in AVIONIC AIR -
R MID indicator light must go off and OVBD legend
R must remain on.



M1-0001-21-185

R Mid Electrical Service Center Exhaust Air Flow Sensor
R Removal and Installation
R Figure 401

MID ELECTRICAL SERVICE CENTER (MESC) EXHAUST AIR FLOW SENSOR ADJUSTMENT AND TEST

1. General

The MESC Exhaust Air Flow Sensor detects duct blockage, fan failure on the ground, or fan failure and failure of the exhaust flow control valve to open in flight. Insufficient airflow detected by the flow sensor illuminates the LO FLO legend in the AVIONIC AIR - MID indicator and the ECS annunicator on the pilots Caution and Warning panel.

The flow sensor is a nonadjustable and nonrepairable component. If the sensor is suspected of malfunctioning, it should be replaced and sent to the shop for a complete test. The following procedure will provide a go/no-go indication of satisfactory operation in the aircraft.

2. Referenced Procedures

	21-25-02	MESC Exhaust Air Flow Sensor - Removal and Installation
	21-25-02	MESC Exhaust Air Flow Sensor - Cleaning and Painting
R R	24-41-00	External Power/Ground Service System - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) On Flight Engineer/Second Officer (FE/SO) ECS MONITOR panel, zone 215, verify that OVBD legend in AVIONIC AIR - MID indicator light is on and that LO FLO legend is off.

(2) Station observer in flight station to monitor AVIONIC AIR - MID indicator light.

R CAUTION: DO NOT KEEP FULL SERVICE ELECTRICAL POWER APPLIED TO AIRCRAFT WITH EXHAUST FAN INOPERATIVE. EQUIPMENT OVERHEATING CAN DAMAGE COMPONENTS AND CAUSE ELECTRICAL FIRES. MESC EXHAUST FAN ALSO EXHAUSTS HYDROGEN GAS GIVEN OFF BY AIRCRAFT BATTERY.

R (3) On FE/SO ELECTRICAL panel, zone 215, select GND SERVICE
R bus for aircraft electrical power (Ref. 24-41-00).

R (4) On galley left circuit breaker panel, zone 137, open circuit breaker FAN - AVIONICS RACK - MAIN (D14).

R NOTE: Battery charging will be inhibited with MESC
R exhaust fan inoperative.

R (5) Verify LO FLO light comes on within 40 seconds.

NOTE: If LO FLO light is not on within 40 seconds, close circuit breaker, remove sensor and clean (Ref. 21-25-02). Reinstall sensor and repeat test. If LO FLO light is still not on within 40 seconds, replace sensor.

R (6) As soon as LO FLO light comes on, close circuit breaker
R opened in Step 3A(3).

R (7) Verify LO FLO light goes off within 40 seconds.

NOTE: If LO FLO light is not off within 40 seconds, remove sensor and clean (Ref. 21-25-02). Reinstall sensor and repeat test. If LO FLO light is still not off within 40 seconds, replace sensor.

R MID_ELECTRICAL_SERVICE_CENTER_(MESC)_EXHAUST_AIR_FLOW_SENSOR CLEANING_AND_PAINTING

1. Equipment_and_Materials

Solvent, Fed Spec P-S-661, or equivalent

Soft-bristle brush

2. Referenced_Procedure

R 21-25-01 MESC Exhaust Air Flow Sensor - Removal and Installation

3. Cleaning/Painting

A. Cleaning

R (1) Using wrench on wrench flats, remove sensor from duct (Ref. 21-25-02 - Removal).

WARNING: DO NOT USE COMPRESSED AIR IN EXCESS OF 10 PSIG. WEAR PROTECTIVE GOGGLES WHILE USING COMPRESSED AIR. FAILURE TO COMPLY MAY RESULT IN EYE INJURY.

R CAUTION: THE SENSOR ELEMENT IS FRAGILE. BE CAREFUL NOT TO DAMAGE ELEMENT WHILE CLEANING.

(2) Brush collected dirt out of element cage on end of sensor with soft bristle brush, or blow sensor clean with compressed air at not more than 10 psi pressure.

WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

(3) Wipe sensor stem with a soft rag moistened with solvent.

R (4) Using wrench on wrench flats, reinstall sensor in duct (Ref. 21-25-01 - Installation).

B. Painting

NOTE: No painting procedure is provided.

FORWARD ELECTRONIC SERVICE CENTER EXHAUST FAN MAINTENANCE PRACTICES

1. General

The forward electronic service center exhaust fan (Forward Avionics Center Exhaust Fan) is located in the forward electronic service center (FESC), Zone 112, in the lower right aft area of the compartment (Ref. Figure 201).

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

6-40-00	Exterior Access Door and Panels, Zone 100
24-41-00	Electrical Power - Description and Operation

4. Maintenance Practices

A. Deactivation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO PREVENT FESC ELECTRONIC EQUIPMENT OPERATIONS WHILE FESC EXHAUST FAN IS INOPERATIVE.

R (1) On galley right circuit breaker panel, zone 130, open and tag circuit breaker FWD AVIONICS - FAN (14E).

(2) Verify the electrical GND SERV system is in operation.

(3) On Flight Engineer/Second Officers (FE/SO) control panel, verify AVIONICS AIR FWD LO FLO light is operative (illuminated).

(4) Verify the FESC Exhaust Fan is free to windmill:

(a) Open access door 112AB (Ref. 6-40-00).

(b) Disconnect electrical cable connector from fan receptacle.

(c) Install protective caps on electrical cable connector and fan receptacle.

R (d) Stow electrical cable connector for flight.

R (e) Remove band clamps securing hose to lower end of
R exhaust fan. (Ref. Fig. 201).

R (f) Work hose from end of fan.

R (g) Blow on exhaust fan to verify it is free to
R windmill.

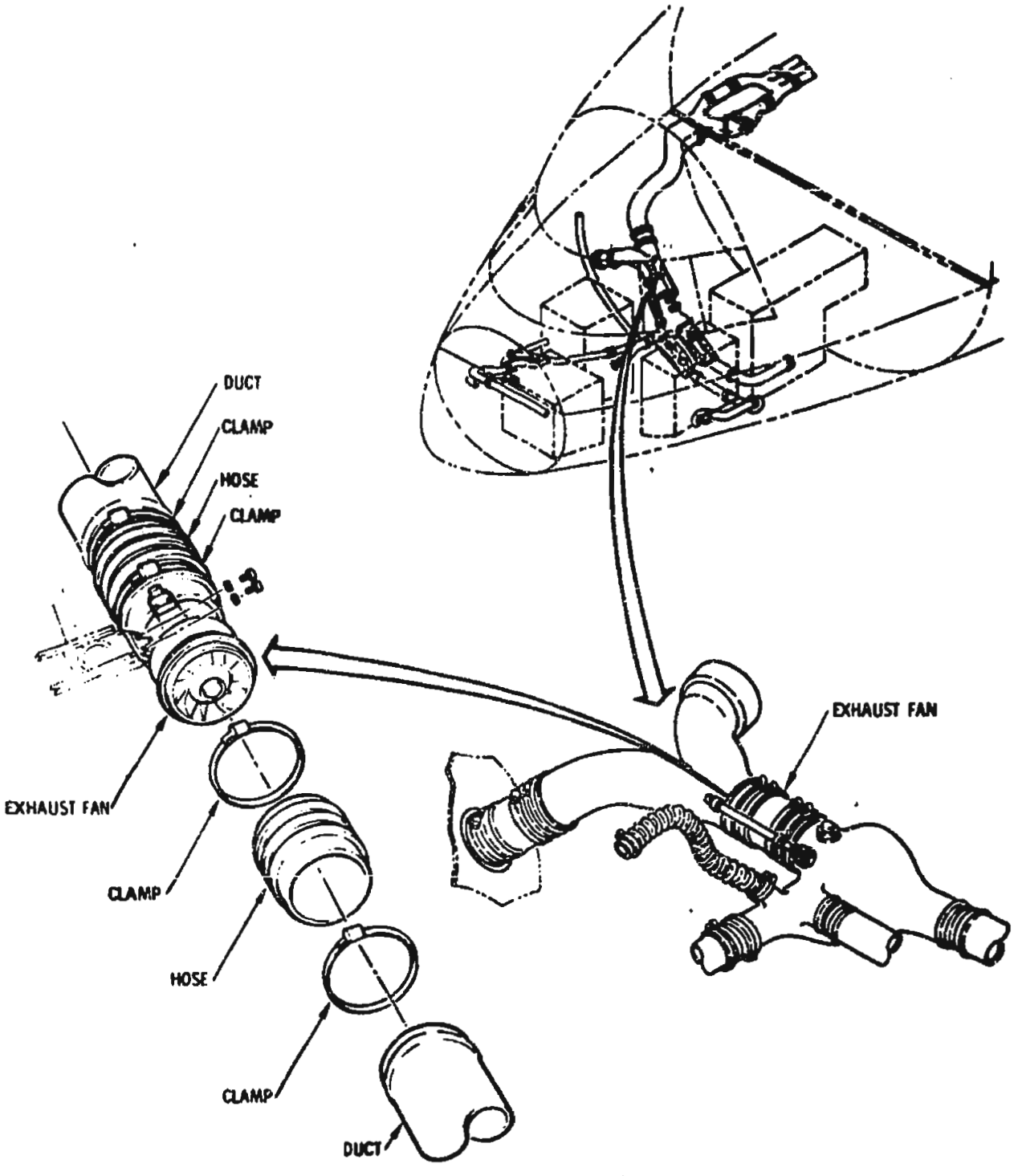
R (h) Work hose onto end of fan.

R (i) Install band clamps securing hose.

R (j) Close access door 112AB.

R (5) On FE/SO panel, placard AVIONICS AIR FWD advisory light
R FESC FAN INOPERATIVE.

R (6) Make appropriate entry in aircraft log book.



M1-83100-21-1011

R Forward Electronic Service Center Exhaust Fan - Maintenance
R Practices
R Figure 201

R EFFECTIVITY: ALL
R
8318

FORWARD ELECTRONIC SERVICE CENTER EXHAUST FAN REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

Protective covers (ducting)

2. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal

CAUTION: DO NOT KEEP ELECTRICAL POWER APPLIED TO AIRCRAFT WITH EXHAUST FAN INOPERATIVE. EQUIPMENT OVERHEATING CAN DAMAGE COMPONENTS AND CAUSE ELECTRICAL FIRES.

(1) On galley right circuit breaker panel, zone 130, open and tag circuit breaker FWD - AVIONICS - FAN (14E).

(2) Disconnect electrical cable connector from fan.

(3) Install protective caps on electrical cable connector and fan receptacle.

(4) Remove band clamps securing hoses to each end of fan.

(5) Support fan and remove mounting bolts.

(6) Slide hoses loose from each end of fan and remove fan.

(7) Install protective covers on duct openings.

B. Installation

R (1) Verify circuit breaker(s) opened in Step 3A(1) is (are)
R open and tagged.

(2) Remove protective covers from duct openings.

(3) Slide ends of fan into hoses with flow arrow pointing up and outboard.

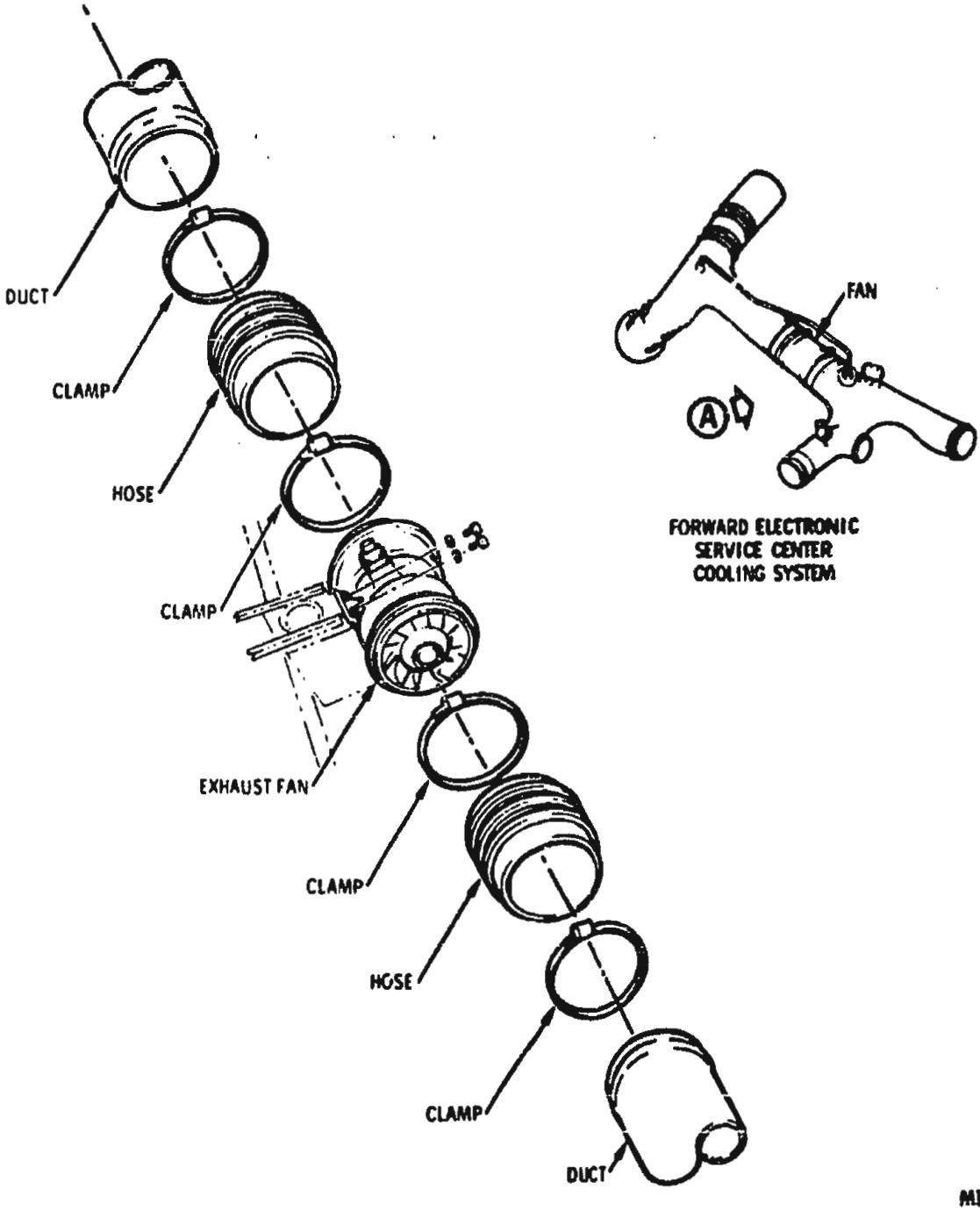
(4) Position fan on mounting support and install and tighten mounting bolts.

(5) Install band clamps on hoses at each end of fan.

(6) Remove protective caps and connect electrical cable connector to fan receptacle.

R (7) Remove tag and close circuit breaker(s) opened in Step
R 3A(1).

(8) Turn on electrical power (Ref. 24-00-00) and verify fan is operating.



M1-0002-21-196

R Forward Electronic Service Center Exhaust Fan
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

0018

R MID ELECTRICAL SERVICE CENTER EXHAUST FAN - MAINTENANCE PRACTICES

1. General

R The Mid Electrical Service Center (MESC) Exhaust Fan evacuates air from the MESC and exhausts the air overboard through the MESC exhaust valve when on the ground and beneath the galley floor in flight. The fan is located in the aft, left corner of the MESC (Ref. Fig. 201).

2. Equipment and Materials

Protective Caps

Jumper Plug (made from PN LS1021R10-5SN plug connecting pins 1, 2 and 3)

Contact Insertion/Removal Tool PN L525C19 or equivalent

3. Referenced Procedures

MM 24-00-00	Electrical Power - Maintenance Practices
MM 24-32-00	Standby Power System - Adjustment and Test

4. Deactivation

NOTE: The MESC Exhaust Fan may be inoperative provided the following conditions exist:

With battery charger operative, flow control valve must be in "ground" mode and MESC differential pressure switch in "pressure" mode.

The charger must be deactivated at cabin differential pressures less than 1.0 psig.

Lower galley modules are not serviced with dry ice.

A. On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR - OVBD (J14).

B. On Flight Engineer/Second Officers overhead circuit breaker panel, CB2, zone 215, open and tag circuit breaker BAT - CHG - INTLK (L6).

C. On Flight Engineer/Second Officer aft circuit breaker panel CB3, zone 215, open and tag circuit breaker BAT - CHG (A15).

D. On left side of mid electrical service center, zone 137, remove electrical connector from mid electrical service center exhaust fan differential pressure switch (Ref. Fig. 201). Install jumper plug connecting pins 1, 2 and 3 of cable connector (to simulate fan pressure actuated switch), and stow connector for flight.

E. Disconnect, cap and stow wire from AIR/GND SENSING RELAY No. 8, relay socket pin B3 (Ref. Fig. 201) to prevent valve from automatically closing after takeoff.

F. Remove tags and close circuit breakers opened in Steps 4A, 4B, and 4C.

G. Turn on electrical power (Ref. MM 24-00-00).

CAUTION: DO NOT OPERATE BATTERY CHARGER FOR MORE THAN ONE MINUTE WITH INOPERATIVE MID ELECTRICAL SERVICE CENTER EXHAUST FAN UNLESS CABIN DIFFERENTIAL PRESSURE IS 1.0 PSIG OR MORE.

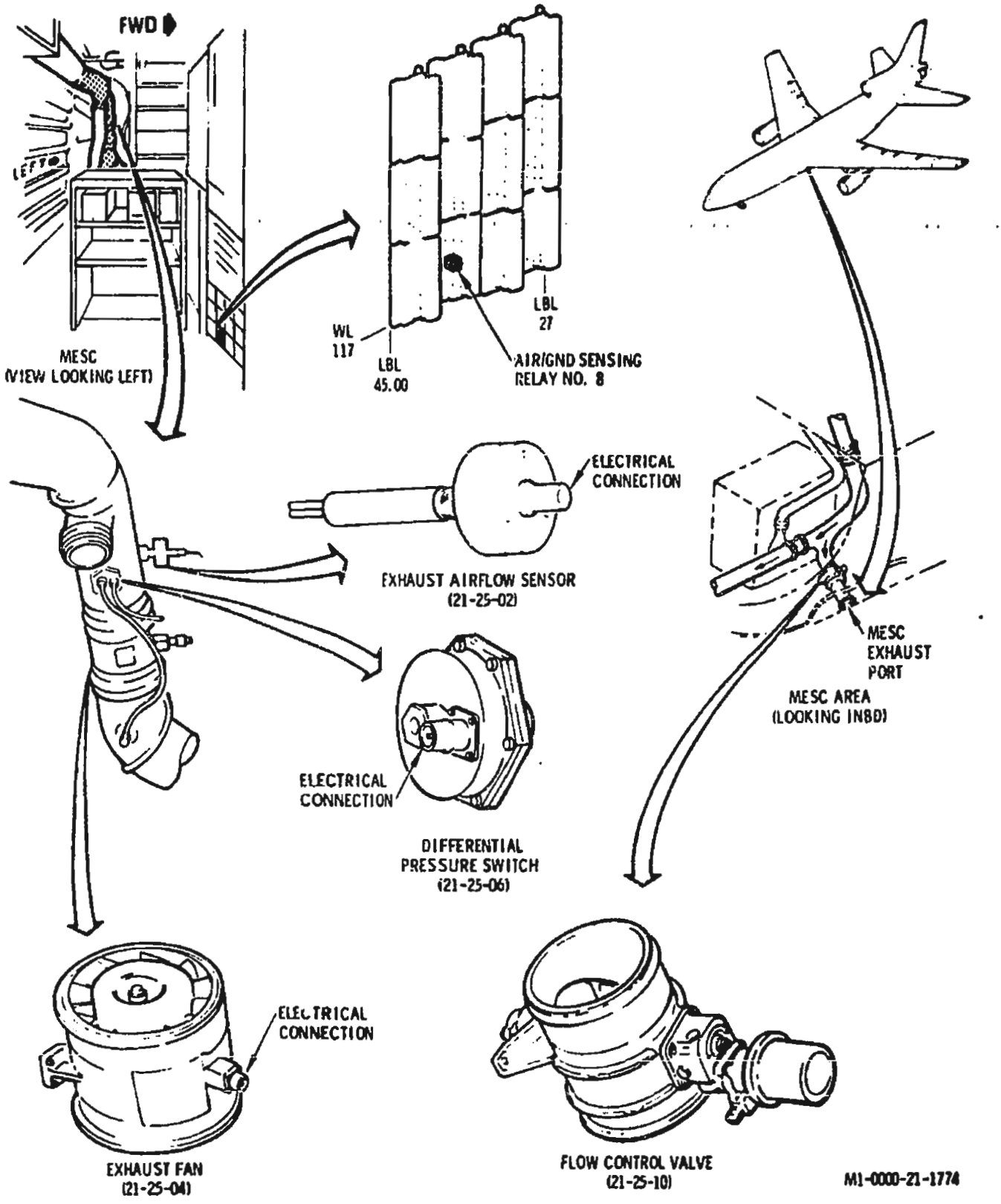
H. Verify battery charger is operative (Ref. MM 24-32-00).

I. On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and collar circuit breaker BAT - CHG (A15).

J. On Flight Engineer/Second Officers ECS MONITOR panel, placard AVIONIC AIR - MID indicator light MESC EXHAUST FAN INOPERATIVE.

K. Make appropriate entry in aircraft log book, including:

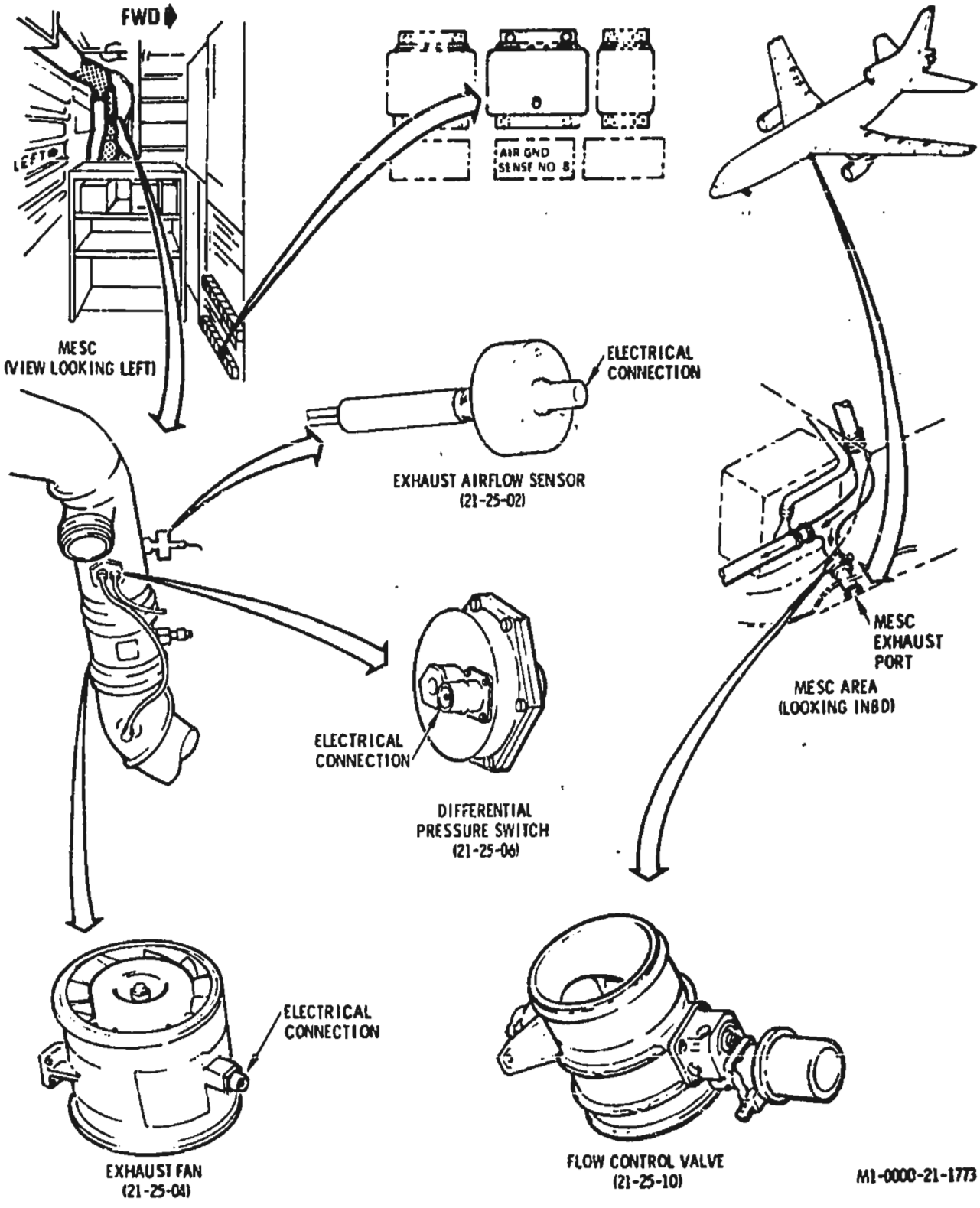
R WARNING: DO NOT OPERATE BATTERY CHARGER UNLESS CABIN DIFFERENTIAL PRESSURE IS 1.0 PSIG OR GREATER.



R Component Location - Deactivation
R Figure 201

R EFFECTIVITY: 001-023

001B



R Component Location - Deactivation
R Figure 201

R EFFECTIVITY: 024-999
R
001B

MID ELECTRICAL SERVICE CENTER EXHAUST FAN REMOVAL AND INSTALLATION

1. General

R The mid electrical service center (MESC) exhaust fan is located
R in the aft section of the mid electrical service center, zone
R 137, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

3. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO PREVENT MESC ELECTRONIC EQUIPMENT OPERATION WHILE MESC EXHAUST FAN IS INOPERATIVE.

A. Removal

(1) On galley left circuit breaker panel, zone 137, open and tag circuit breaker FAN - AVIONICS RACK - MAIN (D14).

R (2) Gain access to MESC.

(3) Disconnect electrical cable connector from fan receptacle.

(4) Install protective caps on cable connector and fan receptacle.

(5) Remove band clamps securing hose at each end of fan.

(6) Support fan and remove mounting bolts.

(7) Work hoses from ends of fan and remove fan from mounting.

(8) Install protective caps on duct openings.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective caps from duct openings.

(3) With fan flow arrow pointing down and outboard work ends of fan into hoses, position fan in place, and install mounting bolts.

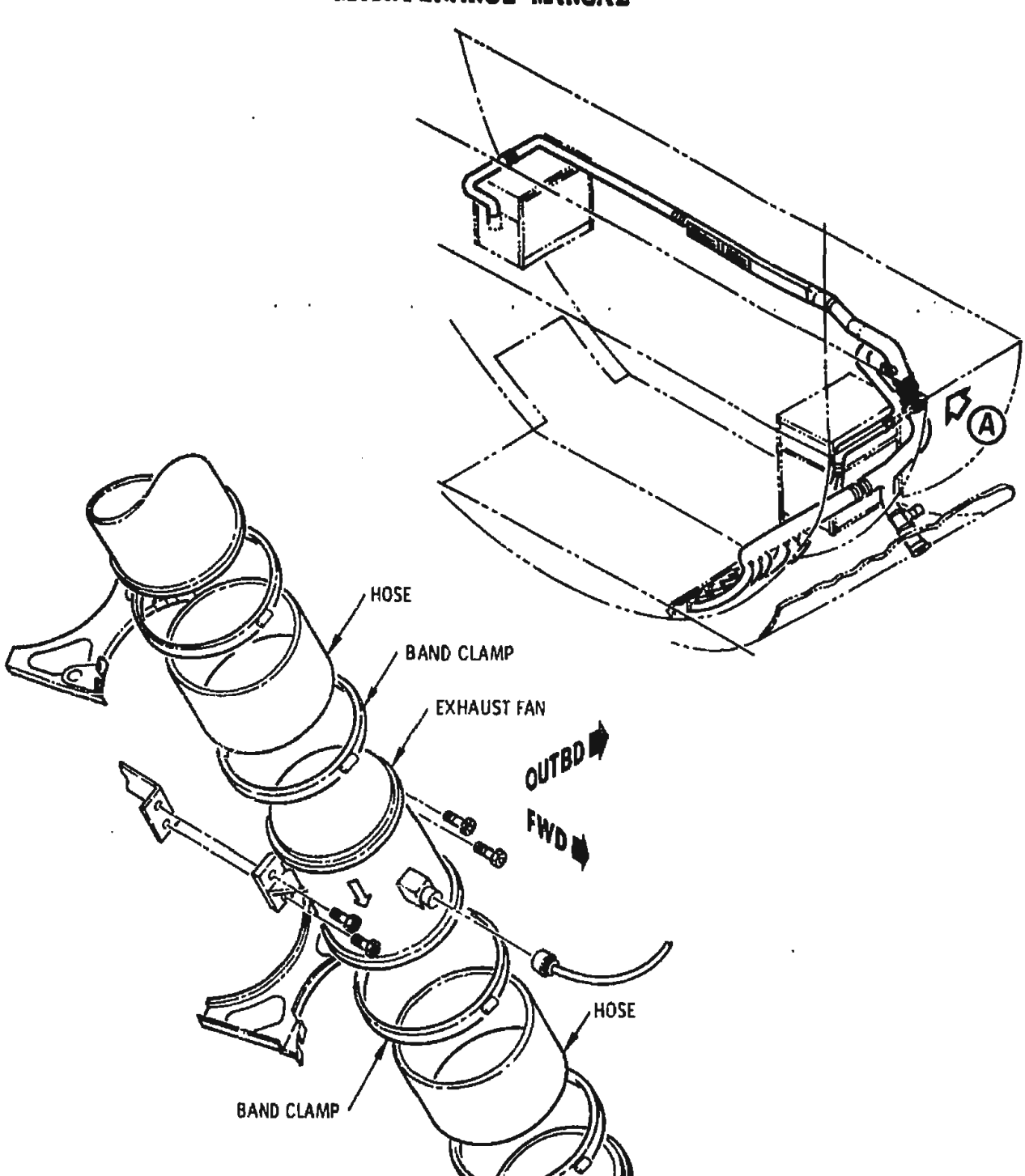
(4) Install band clamps on hoses on each end of fan.

(5) Remove protective caps and connect electrical connector to fan receptacle.

(6) Turn on electrical power (Ref. 24-00-00).

(7) Remove tag and close circuit breaker opened in Step 4A(1). Fan must operate.

R (8) Remove tag installed in Paragraph 4.



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MI-0100-21-186

Mid Electrical Service Center Exhaust Fan
Removal and Installation
Figure 401

FORWARD ELECTRONIC SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH - MAINTENANCE PRACTICES

1. General

R The forward electronic service center (FECS) exhaust fan
R differential pressure switch is located in a duct in the aft
R right side of the FESC, zone 112.

R 2. Equipment and Material

R Protective Caps

R 3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

R 4. Maintenance Practices

A. Deactivation

(1) On pilots overhead circuit breaker panel CB1, zone 210,
R open and tag circuit breaker AIR - OVBD (J14).

(2) In right aft section of forward electronic service center, zone 112, remove electrical cable connector from FESC exhaust fan differential pressure switch. Install jumper from pin 1 to pin 2 of cable connector (to simulate "no pressure" condition), and stow connector for flight.

R (3) Install protective cap on fan receptacle.

R (4) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (5) Verify FESC exhaust air flow control valve and exhaust fan are operative:

(a) Turn on electrical power (Ref. 24-00-00).

(b) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, depress COOL AIR OVBD switchlight to normal (latched in) position. OVBD legend in AVIONIC AIR FWD indicator must come on. Verify air is coming out of the FESC exhaust valve.

(c) Release COOL AIR OVBD switchlight to close (out) position. OVBD legend in AVIONIC AIR FWD indicator must go off.

(d) Again depress COOL AIR OVBD switchlight to normal (latched in) position. OVBD legend in AVIONIC AIR FWD indicator must come on. Verify air is coming out of the FESC exhaust valve.

(e) Turn off electrical power (Ref. 24-00-00).

(6) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, placard AVIONIC AIR FWD indicator light FESC FAN DIFF PRESS SWITCH DEACTIVATED.

(7) Make appropriate entry in aircraft log book.

FORWARD ELECTRONIC SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSORE SWITCH - REMOVAL AND INSTALLATION

1. General

The forward electronic service center exhaust fan differential pressure switch is located in a duct in the aft right side of the forward electronic service center, zone 112 (Ref. Fig. 401). Access is through access door 112AB.

2. Equipment and Materials

Protective caps and plugs

O-rings (3), MS9385-04, or equivalent

3. Referenced Procedure

	21-25-05	Forward Electronic Service Center Exhaust Fan Differential Pressure Switch - Adjustment and Test
R	24-41-00	External Power - Maintenance Practices

4. Removal/Installation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO LIMIT FESC ELECTRONIC EQUIPMENT OPERATION WHILE
R FESC FAN IS INOPERATIVE OR TURN ON GROUND SERVICE
R POWER (REF. 24-41-00).

A. Removal

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR OVBD (J14).

(2) Open access door 112AB.

(3) Disconnect electrical cable connector from switch receptacle.

(4) Install protective caps on electrical cable connector and switch receptacle.

(5) Disconnect downstream sensing tube from L-fitting in top of switch.

(6) Loosen jam nut, remove L-fitting from switch, and discard O-ring.

(7) Remove switch and union from duct.

(8) Remove union and O-rings from switch and discard O-rings.

(9) Install a protective cap on elbow and a plug in the threaded duct opening.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective cap from elbow and plug from threaded duct opening.

(3) Install new upper and lower O-rings on union and install union in switch (Ref. Fig. 401).

(4) Install switch in duct.

(5) Run jam nut fully on long leg of L-fitting and install new O-ring in groove between threaded areas on long leg.

(6) Install long leg of L-fitting into switch, until O-ring touches shoulder of switch fitting, then tighten jam nut on O-ring.

(7) Connect downstream sensing tube to L-fitting in top of switch.

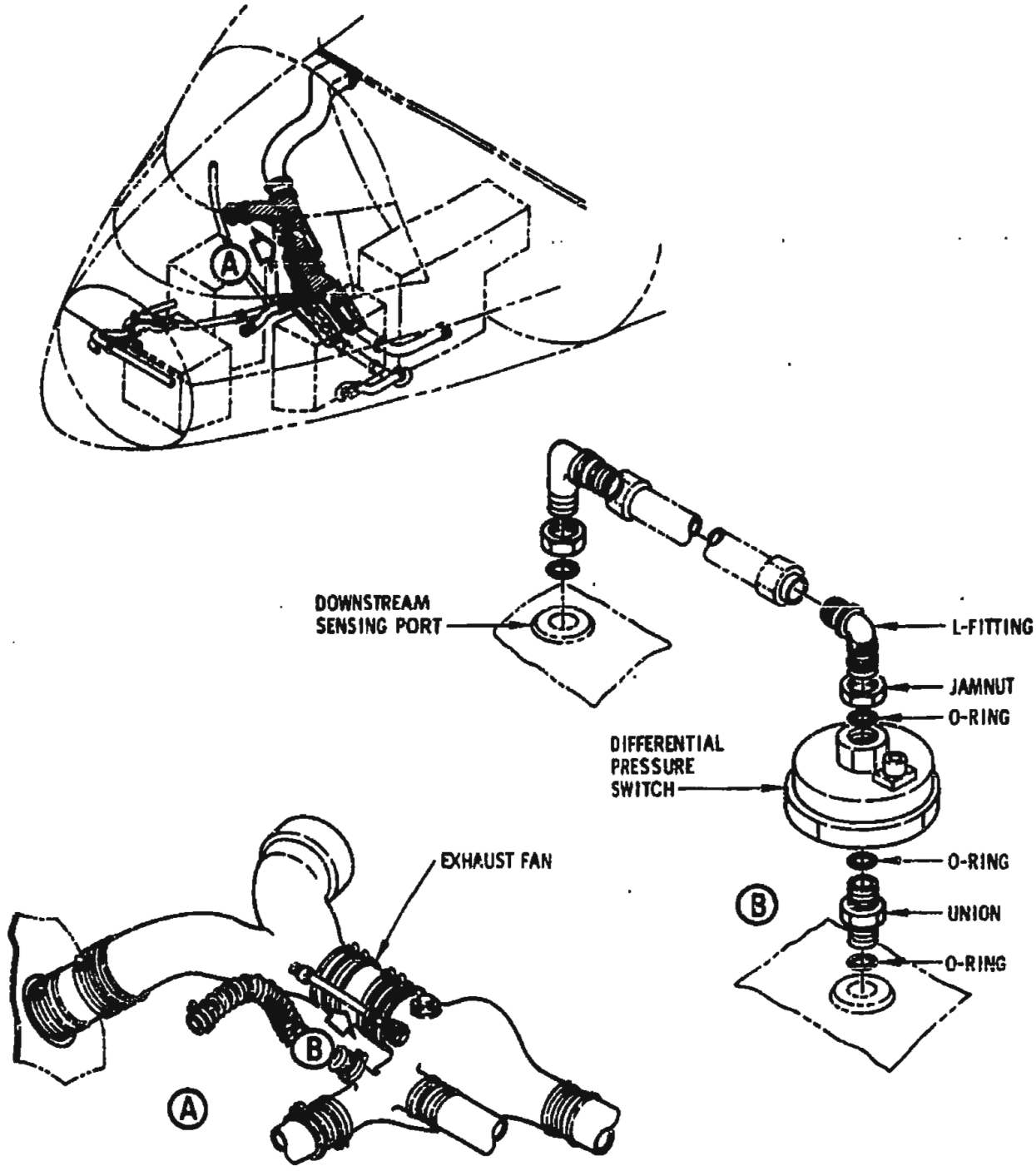
(8) Remove protective caps and connect electrical connector to switch receptacle.

(9) Remove tag and close circuit breaker opened in Step 4A(1).

(10) Make operational test of FESC fan differential pressure switch installation (Ref. 21-25-05).

(11) Close access door 112AB.

(12) Remove CAUTION tag installed in Step 4.



M1-0101-21-197

Forward Electronic Service Center Exhaust Fan
Differential Pressure Switch - Removal and Installation
Figure 401

FORWARD ELECTRONIC SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH - ADJUSTMENT AND TEST

1. General

The FESC exhaust fan differential pressure switch may not be adjusted in the aircraft. The following procedure will verify acceptable switch operation in the aircraft. If switch operation is not as detailed, replace switch.

2. Equipment and Materials (Functional Test)

Pitot/Static field tester Type MB-1, Pitot/Static tester, Burton 2024B, Pitot/Static tester, Millhard Engineering Co. P/N 127, or equivalent

Multimeter, Simpson 260 or equivalent

3. Referenced Procedures

	24-00-00	Electrical Power - Maintenance Practices
R	24-41-00	External Power - Maintenance Practices
	32-63-00	Air/Ground Sensing System - Adjustment and Test
	33-17-00	Annunciator System - Adjustment and Test

4. Adjustment/Test

A. Operational Test

(1) On the following circuit breaker panels, verify the listed circuit breakers are closed:

(a) Pilots overhead circuit breaker panel CB1, zone 210:

AIR OVBD (J14)

(b) Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215:

AVIONICS AIR MON (L5)

(c) Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215:

CARGO TEMP - FWD/MID (W9)

(d) Galley right circuit breaker panel, zone 137:

FWD AVIONICS FAN (E14)

(2) Turn on electrical power (Ref. 24-00-00).

(3) Verify annunciator system (advisory lights) is operational (Ref. 33-17-00). If ECS annunciator light in pilots instrument panel is on, reset annunciator system. ECS legend must go off.

(4) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, depress COOL AIR OVBD switchlight to normal (latched in) position.

(5) Verify FESC exhaust fan is operating and exhaust control valve is open. To verify, check for fan-driven exhaust air flow from the approximately 6 by 8-inch oval opening in the lower right forward fuselage, below the flight station windows.

(6) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, verify the following:

(a) COOL AIR OVBD switchlight; CLOSE legend off.

(b) AVIONIC AIR - FWD indicator lights: OVBD legend on, LO FLO legend off

R
R CAUTION: DO NOT ALLOW FESC EXHAUST CONTROL VALVE TO REMAIN CLOSED OR EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN REQUIRED FOR TEST OR TURN ON GROUND SERVICE POWER (REF. 24-41-00).

(7) Deactuate air/ground sensing relays to "Air" position by simulating in-flight condition (Ref. 32-63-00) and verify the following:

(a) FESC exhaust valve closes. To verify, check that exhaust air is no longer flowing from exhaust opening.

(b) AVIONIC AIR - FWD indicator light: OVBD legend off, LO FLO legend off.

(c) Pilots ECS annunciator light: ECS legend off.

(8) On galley right circuit breaker panel, zone 137, open circuit breaker FWD AVIONICS FAN (E14) and verify the following:

(a) FESC exhaust fan stops.

(b) FESC exhaust control valve opens.

(c) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLO legend on.

(d) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on.

(9) Reset annunciator system. ECS legend must go off.

(10) Close circuit breaker opened in Step (8) and verify the following:

(a) FESC exhaust fan operates.

(b) FESC exhaust valve closes.

(c) AVIONIC AIR - FWD indicator light: OVBD legend off, LO FLO legend off.

(d) Pilots ECS annunciator light: ECS legend off.

(11) Return air/ground sensing system to normal on-ground condition (Ref. 32-63-00) and verify the following:

(a) FESC exhaust control valve opens.

(b) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLO legend off.

(c) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on.

(12) Reset annunciator system. ECS legend must go off.

(13) Turn off electrical power (Ref. 24-00-00).

B. Functional Test

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag AIR OVBD, (J14) circuit breaker.

(2) On galley right circuit breaker panel, zone 137, open and tag FWD AVIONICS FAN (E14) circuit breaker.

(3) Open FESC access door 112AB.

(4) In FESC, on right side at FS 265, disconnect sense tube from top of differential pressure switch. Adjust tester to use airspeed indicator (knots) as

differential pressure indicator and connect pressure port of tester to top of differential pressure switch.

(5) Disconnect electrical connector from switch.

(6) Check continuity between switch connector pins as follows:

1 to 2	continuity
1 to 3	no continuity

(7) Connect multimeter between pins 1 and 3.

CAUTION: DO NOT EXCEED 115 KNOTS INDICATED AIRSPEED (8.5 INCHES OF WATER) WHEN PERFORMING STEP (8).

R (8) On aircraft with 804100 or 804100-1 (672555-101 or
R 672555-105) Switch,
R slowly increase tester indicated airspeed. Switch must
R actuate, pins 1 to 3 show continuity, with indicated
R airspeed of 67 to 78 knots (3.0 to 4.0 inches of
R water). Stop and hold pressure.

R (8) On aircraft with 804100-2 (672555-107) Switch,
R slowly increase tester pressure. Switch must actuate,
R pins 1 to 3 show continuity, when pressure has
R increased to 0.85 to 1.15 inches of water. Stop and
R hold pressure.

(9) Connect multimeter between pins 1 and 2. Verify no continuity.

R (10) On aircraft with 804100 or 804100-1 (672555-101 or
R 672555-105) Switch,
R slowly decrease indicated airspeed. Switch must open,
R pins 1 to 2 show continuity, when indicated airspeed
R has decreased 5 knots, to 68 to 73 knots (2.5 to 3.5
R inches of water).

R (10) On aircraft with 804100-2 (672555-107) Switch,
R slowly decrease tester pressure. Switch must open,
R pins 1 to 2 show continuity, when pressure has
R decreased 0.35 inches of water, to 0.50 to 0.80 inches
R of water.

R (11) Reduce indicated airspeed and pressure to zero and disconnect tester.

(12) Reconnect sense tube to top of switch.

(13) Reconnect electrical connector to switch.

(14) Remove tags and close circuit breakers opened in Steps 4B(1) and 4B(2).

(15) Perform operational test (Ref. 21-25-05, Paragraph 4A) of FESC Fan Differential Pressure Switch.

(16) Close FESC access door 112AB.

MID ELECTRICAL SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH DEACTIVATION

R
R

1. General

The mid electrical service center exhaust fan differential pressure switch is located in a duct in the left aft portion of
R the mid electrical service center (MESC), zone 137 (Ref. MM
R 21-25-04, Fig. 201).

2. Equipment and Materials

R Protective Caps

R Jumper Plug (made from PN LS10215R10-5SN plug connecting pins 1,
R 2 and 3)

R Contact Insertion/Removal Tool PN L525C19 or equivalent

R 3. Referenced Procedures

R	MM 24-00-00	Electrical Power System - Maintenance Practices
R	MM 24-32-00	Standby Power System - Adjustment and Test
R	MM 21-25-04	Figure 201

R 4. Deactivation

R NOTE: The MESC Fan Differential Pressure Switch may be
R inoperative provided:

R MESC airflow sensor (LO FLO light) is operative.

R Differential pressure sensing system is placed in the
R normal "pressure" position.

R MESC Exhaust fan is operative.

R MESC exhaust flow control valve is placed in "ground"
R mode.

R A. On pilots overhead circuit breaker panel CB1, zone 210, open
R and tag circuit breaker AIR - OVBD (J14).

R B. On Flight Engineer/Second Officers overhead circuit breaker
R panel CB2, zone 215, open and tag circuit breaker BAT - CHG
R - INTLK (L6).

R C. On Flight Engineer/Second Officers aft circuit breaker panel
R CB3, zone 215, open and tag circuit breaker BAT - CHG (A15).

R D. On left side of MESC, zone 137, remove electrical connector
R from MESC exhaust fan differential pressure switch (Ref. MM
R 21-25-04, Fig. 201). Install jumper plug connecting pins 1,
R 2 and 3 of cable connector (to simulate fan pressure
R actuated switch) and stow connector for flight.

R E. Disconnect, cap and stow wire from AIR/GND SENSING RELAY NO.
R 8, relay socket pin B3 (Ref. MM 21-25-04, Fig. 201), to
R prevent valve from automatically closing after takeoff.

R F. Remove tags and close circuit breakers opened in Step 4A, 4B
R and 4C.

R G. Turn on electrical power (Ref. MM 24-00-00).

R H. Verify MESC exhaust fan is operating and exhaust flow
R control valve is open, as evidenced by exhaust air flowing
R from exhaust opening in left wing leading edge fillet (Ref.
R MM 21-25-04, Fig. 201).

R I. Verify MESC exhaust flow control valve is operative:

R (1) On Flight Engineer/Second Officers ECS MONITOR panel,
R zone 215, release COOL AIR OVBD switchlight to close
R (out) position. OVBD legend in AVIONIC AIR - MID
R indicator must go off.

R (2) Depress COOL AIR OVBD switchlight to normal (latched
R in) position. OVBD legend in AVIONIC AIR - MID
R indicator must come on.

R J. Verify battery charger is operative (Ref. MM 24-32-00).

R K. On Flight Engineer/Second Officers ECS MONITOR panels, zone
R 215, placard AVIONIC AIR - FWD indicator light FAN DIFF
R PRESS SWITCH DEACTIVATED.

R L. Make appropriate entry in aircraft log book.

MID ELECTRICAL SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH - REMOVAL AND INSTALLATION

1. General

R The mid electrical service center (MESC) exhaust fan
R differential pressure switch is located in a duct in the left
R aft portion of the mid electrical service center, zone 137,
R (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

O-rings (2), MS9385-04, or equivalant

3. Referenced Procedure

21-25-06 Mid Electrical Service Center Exhaust Fan Differential Pressure Switch - Adjustment and Test

4. Removal/Installation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO LIMIT MESC ELECTRONIC EQUIPMENT OPERATION WHILE MESC FAN DIFFERENTIAL PRESSURE SWITCH IS INOPERATIVE.

A. Removal

(1) R On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR - OVBD (J14).

(2) R Gain access to MESC.

(3) Disconnect electrical cable connector from pressure switch receptacle.

(4) Install protective caps on electrical cable connector and pressure switch receptacle.

(5) Disconnect hose from union in top of switch and disconnect hose from reducer in duct downstream from exhaust fan.

(6) Inspect hose and reducers for blockage, if blocked purge with dry nitrogen.

(7) Remove union and O-ring from pressure switch and discard O-ring.

(8) Remove switch and O-ring from reducer and discard O-ring.

(9) Install protective caps on hose and on reducers in duct openings.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective caps from reducers in duct openings.

(3) Install new O-ring and pressure switch on reducer (Ref. Fig. 401).

(4) Install new O-ring on union and install union in pressure switch.

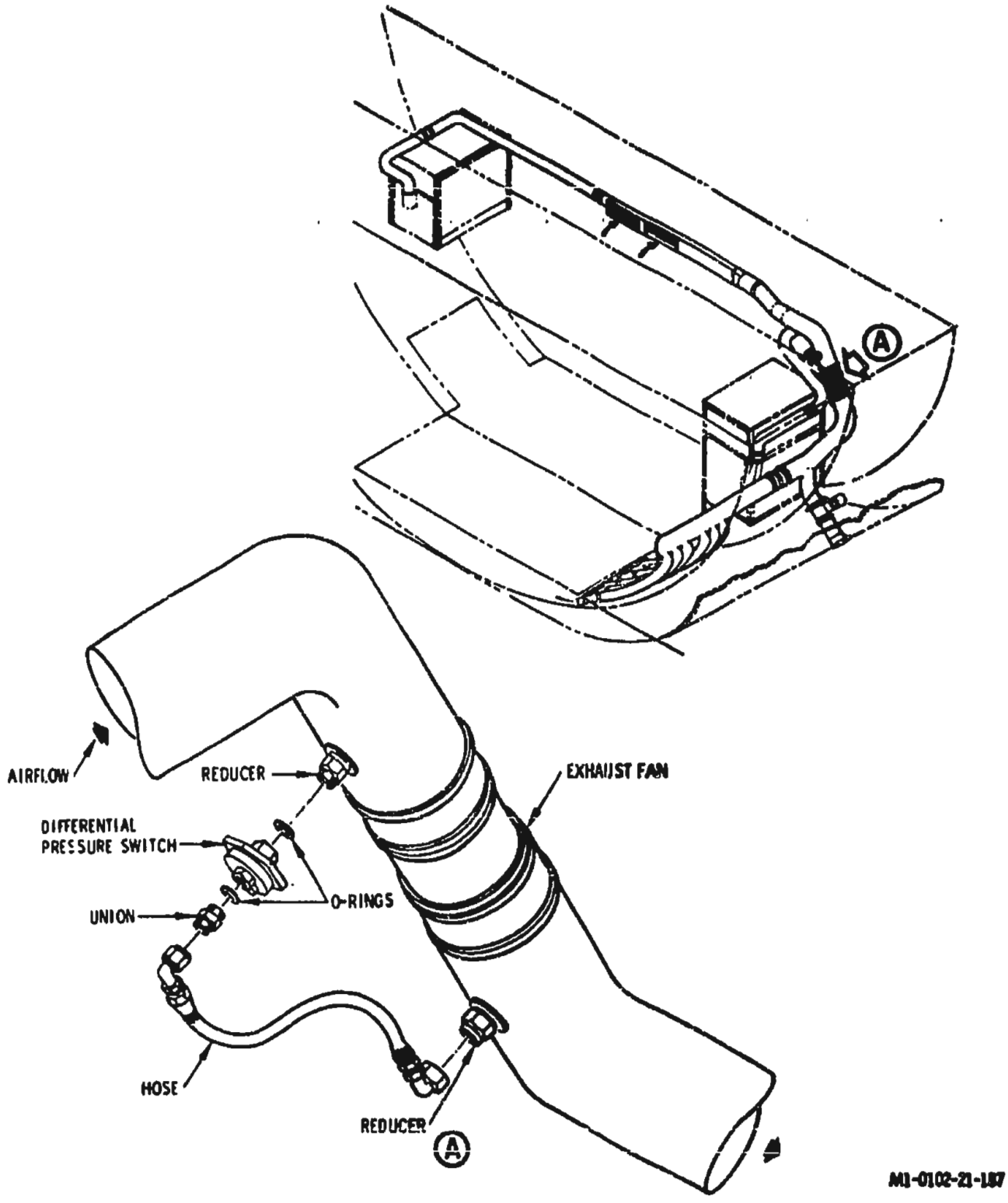
(5) Connect hose to union and to reducer downstream from exhaust fan.

(6) Remove protective caps and connect electrical connector to switch receptacle.

(7) Remove tag and close circuit breaker opened in Step 4A(1).

(8) Make operational test of MESC fan differential pressure switch installation and operation (Ref. 21-25-06).

R (9) Remove CAUTION tag installed in Paragraph 4.



R Mid Electrical Service Center Exhaust Fan
R Differential Pressure Switch - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

MID ELECTRICAL SERVICE CENTER EXHAUST FAN DIFFERENTIAL PRESSURE SWITCH - ADJUSTMENT AND TEST

1. General

The MESC exhaust fan differential pressure switch may not be adjusted in the aircraft. The following procedure will verify acceptable switch operation in the aircraft. If switch operation is not as detailed, replace switch.

2. Equipment and Materials (Functional Test)

Pitot/Static field tester Type MB-1, Pitot/Static tester, Burton 2024B, Pitot/Static Tester, Millhard Engineering Co. PN 127, or equivalent

Multimeter, Simpson 260, or equivalent

3. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
24-32-00	Standby Power System - Description and Operation
32-63-00	Air/Ground Sensing System - Adjustment and Test
33-17-00	Annunciator System - Adjustment and Test

4. Adjustment/Test

A. Operational Test

(1) On the following circuit breaker panels, verify the listed circuit breakers are closed:

(a) Pilots overhead circuit breaker panel CB1, zone 210:

R AIR OVBD (J14)

(b) Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215:

R AVIONICS AIR MON (L5)

R BAT CHG INTLK (L6)

(c) Flight Engineer/Second Officers aft circuit breaker panel, zone 215:

R CARGO TEMP - FWD/MID (W9)

(d) Galley left circuit breaker panel, zone 137:

R FAN - AVIONICS RACK - MAIN (D14)

(2) Turn on electrical power (Ref. 24-00-00).

(3) Verify annunciator system (advisory lights) is operational (Ref. 33-17-00). If ECS annunciator light in pilots instrument panel is on, reset annunciator system. ECS legend must go off.

(4) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, depress COOL AIR OVBD switchlight to normal (latched in) position.

(5) Verify MESC exhaust fan is operating and exhaust control valve is open. To verify, check for fan-driven exhaust air flow from the approximately 5 by 7-inch oval opening in the left forward wing-to-fuselage fairing.

(6) Verify battery charger is operating (Ref. 24-32-00).

(7) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, verify the following:

(a) COOL AIR OVBD switchlight: CLOSE legend off.

(b) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend off.

CAUTION: DO NOT ALLOW MESC EXHAUST CONTROL VALVE TO REMAIN CLOSED NOR EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN REQUIRED FOR TEST.

(8) Deactuate air/ground sensing relays to "Air" position by simulating in-flight condition (Ref. 32-63-00) and verify the following:

(a) MESC exhaust valve closes. To verify, check that exhaust air is no longer flowing from exhaust opening.

(b) AVIONIC AIR - MID indicator light: OVBD legend off, LO FLO legend off.

(c) Pilots ECS annunciator light: ECS legend off.

(9) On galley left circuit breaker panel, zone 137, open circuit breaker FAN - AVIONICS RACK - MAIN (D14) and verify the following:

(a) MESC exhaust fan stops.

(b) MESC exhaust control valve opens.

(c) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend on within 40 seconds.

R (d) Pilots ECS annunciator light: ECS legend flashes for approximately 10 seconds, then remains on.

(e) Battery charger is not operating (Ref. 24-32-00).

(10) Close circuit breaker opened in Step (9) and verify the following:

(a) MESC exhaust fan operates.

(b) MESC exhaust valve closes.

(c) AVIONIC AIR - MID indicator light: OVBD legend off, LO FLO legend off.

(d) Pilots annunciator light: ECS legend off.

(e) Battery charger operates (Ref. 24-32-00).

(11) Return air/ground sensing system to normal on-ground condition (Ref. 32-63-00) and verify the following:

(a) MESC exhaust control valve opens.

(b) AVIONIC AIR - MID indicator light: OVBD legend on, LO FLO legend off.

(c) Pilots ECS light off.

(12) Turn off electrical power (Ref. 24-00-00).

B. Functional Test

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag AIR OVBD (J14) circuit breaker.

(2) On galley left circuit breaker panel, zone 137, open and tag FAN - AVIONICS RACK - MAIN (D14) circuit breaker.

(3) Gain access to MESC.

(4) In MESC, on left side at FS 973 disconnect sense tube from top of differential pressure switch. Adjust tester to use airspeed indicator (Knots) as differential pressure indicator and connect pressure port of tester to top of differential pressure switch.

(5) Disconnect electrical connector from switch.

(6) Check continuity between switch connector pins as follows:

1 to 2	continuity
1 to 3	no continuity

(7) Connect multimeter between pins 1 and 3.

CAUTION: DO NOT EXCEED 115 KNOTS INDICATED AIRSPEED (8.5 INCHES OF WATER) WHEN PERFORMING STEP (8).

R (8) On aircraft with 804100 or 804100-1 (672555-101 or
R 672555-105) Switch,
R slowly increase tester indicated airspeed. Switch must
R actuate, pins 1 to 3 show continuity, when indicated
R airspeed has increased to 67 to 78 knots (3.0 to 4.0
R inches of water). Stop and hold pressure.

R (8) On aircraft with 804100-2 (672555-107) Switch,
R slowly increase tester pressure. Switch must actuate,
R pins 1 to 3 show continuity, when pressure has
R increased to 0.85 to 1.15 inches of water. Stop and
R hold pressure.

(9) Connect multimeter between pins 1 and 2. Verify no continuity.

R (10) On aircraft with 804100 or 804100-1 (672555-101 or
R 672555-105) Switch,
R slowly decrease indicated airspeed. Switch must open,
R pins 1 to 2 show continuity, when indicated airspeed
R has decreased 5 knots, to 62 to 73 knots (2.5 to 3.5
R inches of water).

R (10) On aircraft with 804100-2 (672555-107) Switch,
R slowly decrease tester pressure. Switch must open,
R pins 1 to 2 show continuity, when pressure has
R decreased 0.35 inches of water, to 0.50 to 0.80 inches
R of water.

R (11) Reduce indicated airspeed and pressure to zero and disconnect tester.

(12) Reconnect sense tube to top of switch.

(13) Reconnect electrical connector to switch.

(14) Remove tags and close circuit breakers opened in Steps 4B(1) and 4B(2).

(15) Perform operational test (Ref. 21-25-06, Paragraph 4A) of MESC Fan Differential Pressure Switch.

FORWARD ELECTRONIC SERVICE CENTER EXHAUST DUCT CHECK VALVE REMOVAL AND INSIALLAIION

1. General

R The forward electronic service center (FESC) exhaust duct check
R valve is located in the aft right portion of the forward
R electronic service center, zone 112, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

3. Referenced Procedures

24-41-00 External Powers - Maintenance Practices

4. Removal/Installation

R A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) ECS monitor
R panel to prevent FESC electronic equipment operation
R while FESC exhaust duct check valve and exhaust fan are
R inoperative or turn on ground service power (Ref.
R 24-41-00).

R (2) On galley right circuit breaker panel, zone 137, open
R and tag circuit breaker FWD AVIONICS FAN (E14).

R (3) Gain access to FESC.

R (4) Remove band clamps securing hoses at each end of valve
R housing.

R (5) Support valve and remove valve mounting bolts.

R (6) Work rubber hose from each end of valve and remove
R valve.

R (7) Install protective caps on duct openings.

B. Installation

R (1) Verify circuit breaker opened in Step 4A(2) is open and tagged.

(2) Remove protective caps from duct openings.

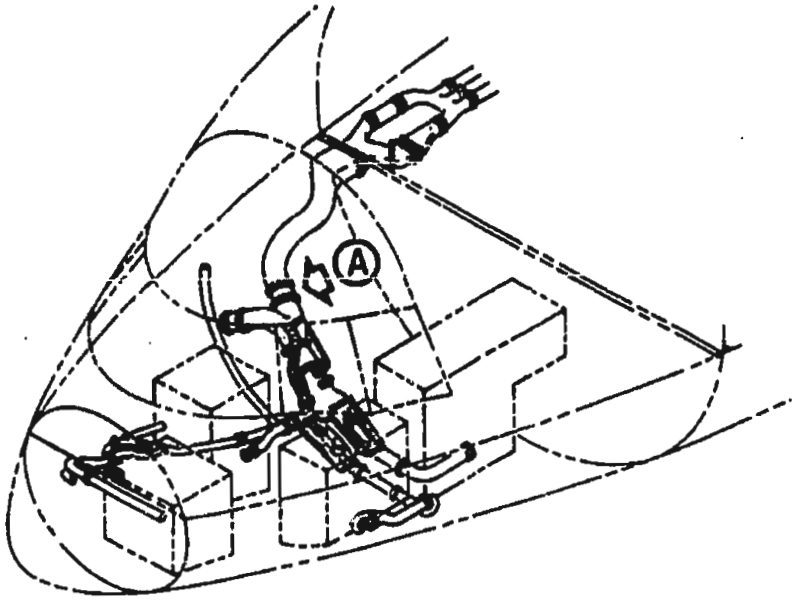
(3) Position valve with airflow arrow pointing outboard and up.

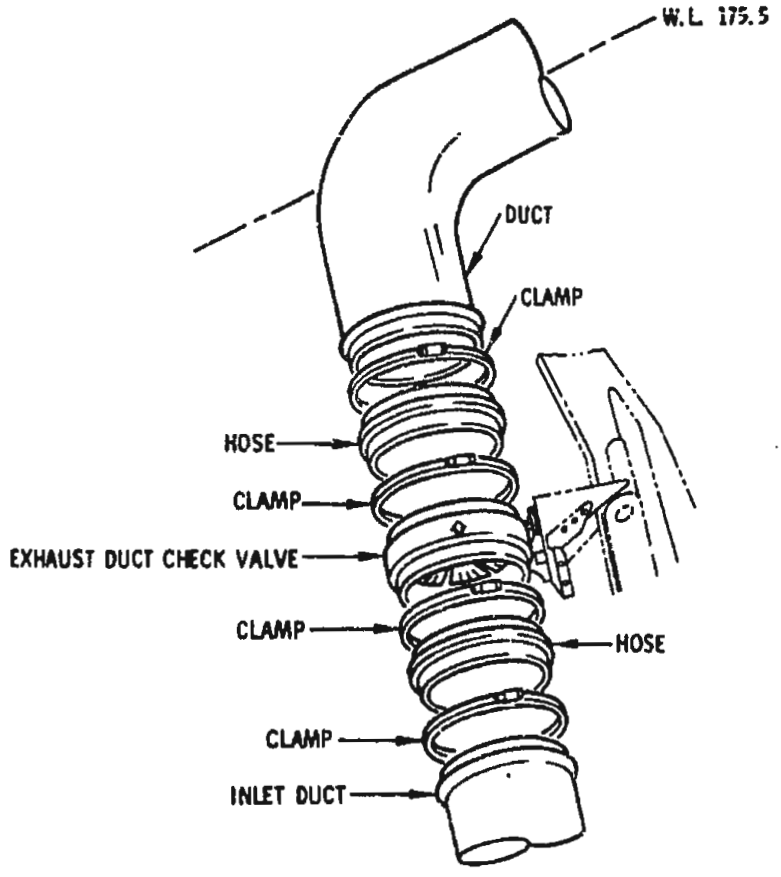
(4) Work rubber hoses over each end of valve housing and install valve mounting bolts.

(5) Install band clamps securing hoses at each end of valve housing.

R (6) Remove tag and close circuit breaker opened in Step
R 4A(2).

R (7) Remove tag installed in Step 4A(1).





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R Forward Electronic Service Center Exhaust Duct Check Valve
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

FORWARD ELECTRICAL SERVICE CENTER EXHAUST DUCT CHECK VALVE ADJUSTMENT AND TEST

1. General

The forward electrical service center (FESC) exhaust duct check valve is located in the right portion of the FESC, zone 112. The FESC Exhaust Duct Check Valve is not adjustable and can only be tested. The following procedure will verify valve operation or malfunction.

2. Referenced Procedures

21-25-01	Forward Electrical Service Center Exhaust Air Flow Sensor - Removal and Installation
R 21-25-07	Forward Electrical Service Center Exhaust Duct Check Valve - Removal and Installation

3. Adjustment/Test

A. Functional Test

(1) On Flight Engineers/Second Officers (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS AIR MON (L5).

(2) Locate FESC Exhaust Air Flow Sensor in right side of the FESC, zone 112, (Ref. Fig. 501).

(3) Remove FESC Exhaust Air Flow Sensor from ducting and temporarily stow in a safe place (Ref. 21-25-01).

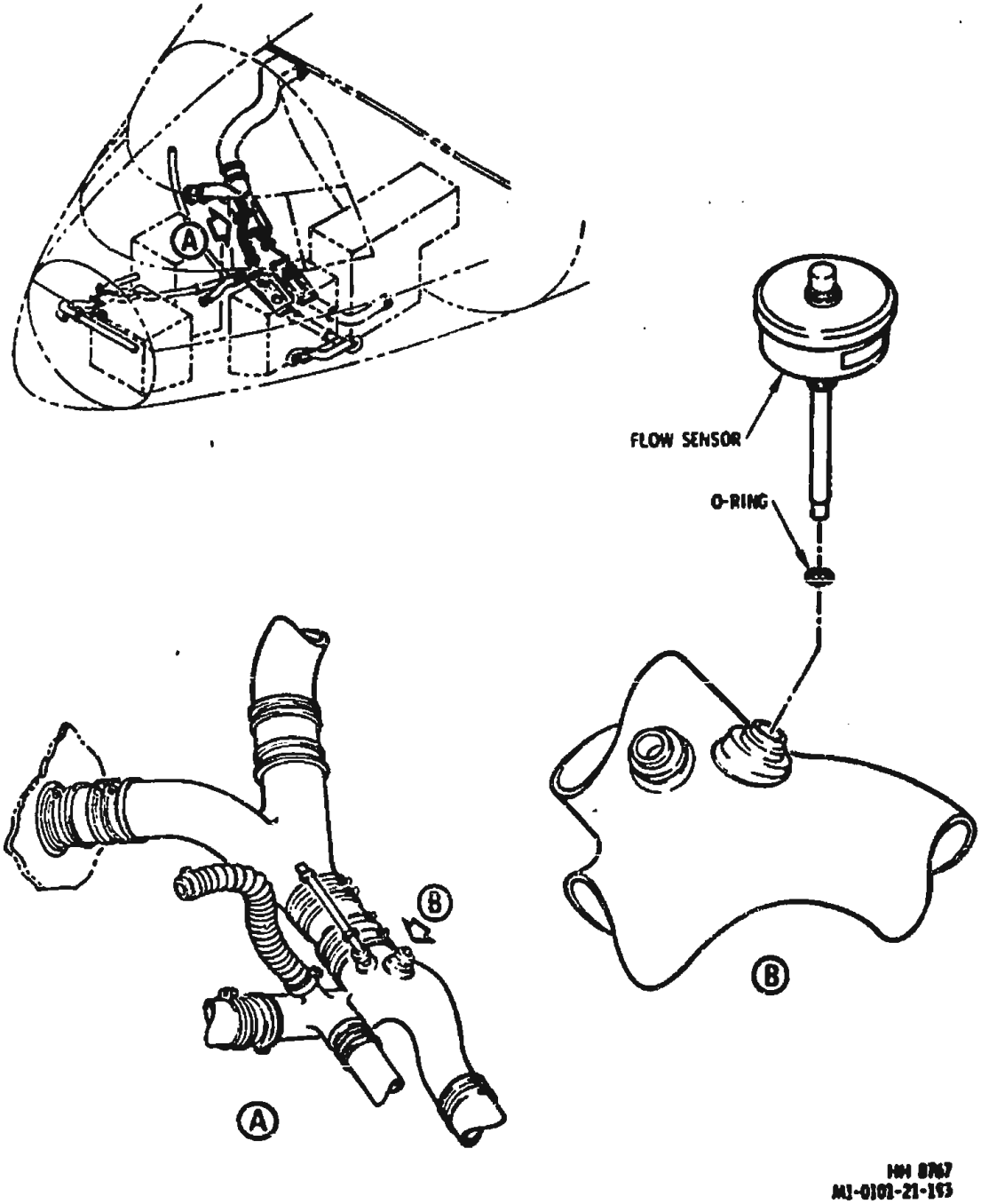
(4) Close circuit breaker opened in Step 3A(1).

(5) Close FESC Exhaust Flow Control Valve at FE/SO Console, ECS MONITOR panel, by depressing COOL AIR OVBD switchlight so it illuminates CLOSE.

(6) Place hand over FESC Exhaust Flow Sensor boss on duct. If air is being drawn into boss, check valve is OK, proceed to Step 7.

If air is being blown out of sensor boss on duct, replace FESC Exhaust Duct Check Valve, (Ref. 21-25-07).

(7) Reinstall sensor.



FESC Exhaust Duct Check Valve - Test Location
Figure 501

MID ELECTRICAL SERVICE CENTER EXHAUST DUCT CHECK VALVE REMOVAL AND INSTALLATION

1. General

R The mid electrical service center (MESC) exhaust duct check
R valve is located in the upper left portion of the mid electrical
R service center, zone 137, (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

O-ring, MS9068-258, or equivalent

3. Referenced Procedures

20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices

4. Removal/Installation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO PREVENT MESC ELECTRONIC EQUIPMENT OPERATION WHILE MESC DUCT CHECK VALVE AND EXHAUST FAN ARE INOPERATIVE.

A. Removal

(1) On galley left circuit breaker panel, zone 137, open and tag circuit breaker FAN - AVIONICS RACK - MAIN (D14).

R (2) Gain access to MESC.

(3) Remove band clamp from hose and support bracket at forward end of check valve (Ref. Fig. 401).

(4) Remove single T-bolt coupling (Ref. 20-36-01) and O-ring from aft end of check valve and discard O-ring.

(5) Work valve from hose and remove valve.

(6) Install protective caps on duct openings.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective caps from duct openings.

(3) Position check valve between ducts, with airflow arrow pointing forward (Ref. Fig. 401).

(4) Work forward end of valve into hose on duct.

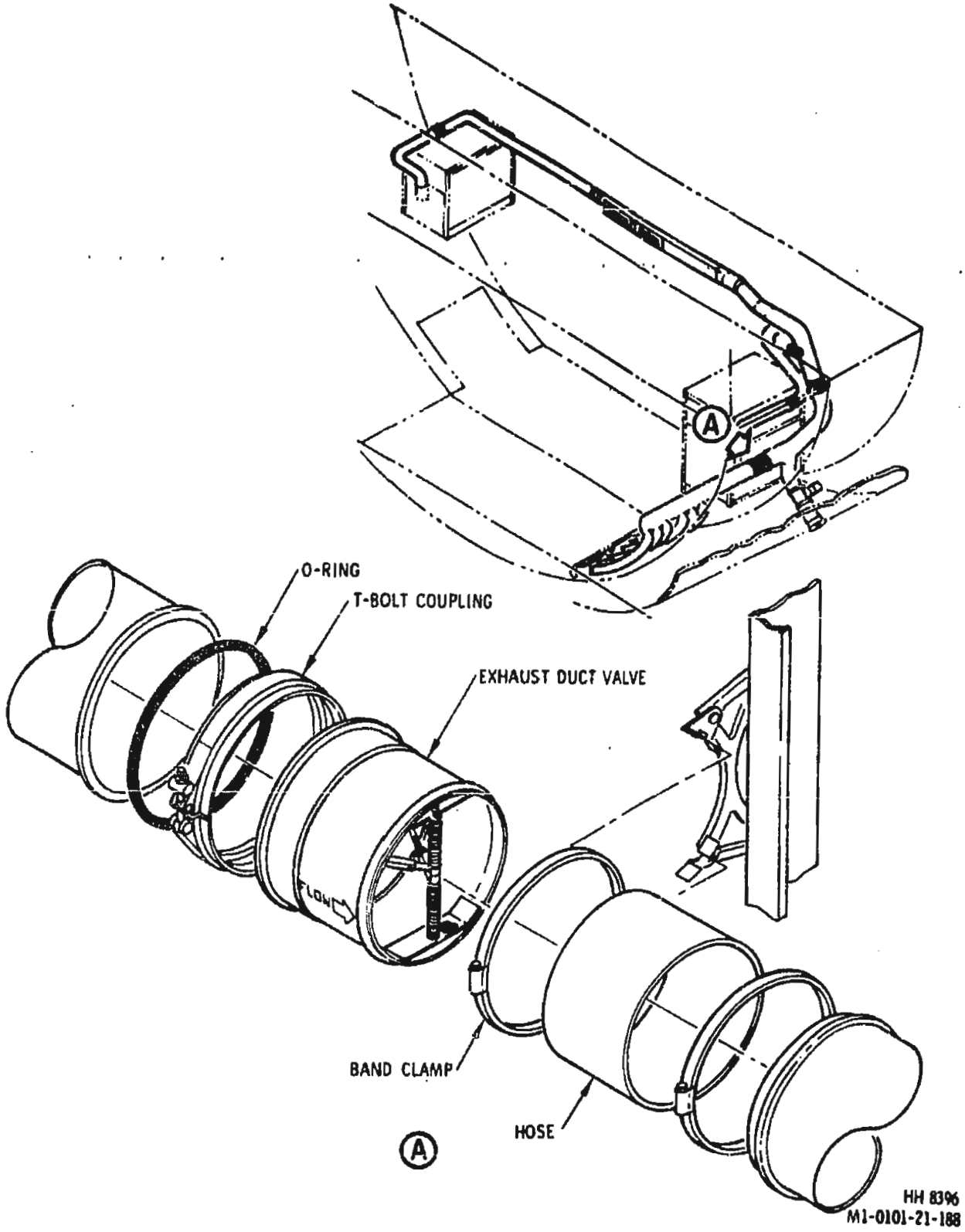
(5) Install O-ring and T-bolt coupling at aft end of check valve (Ref. 20-36-01).

(6) Install band clamp on hose and support bracket at forward end of valve.

R (7) Remove tag and close circuit breaker opened in Step 4A(1).

R (8) Remove tag installed in Paragraph 4.

R (9) Perform adjustment and test.



R Mid Electrical Service Center Exhaust Duct Check Valve
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

MID ELECTRICAL SERVICE CENTER EXHAUST DUCT CHECK VALVE ADJUSTMENT AND TEST

1. General

The mid electrical service center (MESC) exhaust duct check valve is located in the upper left portion of the MESC, zone 137. The MESC Exhaust Duct Check Valve is not adjustable and can only be tested. The following procedure will verify valve operation or malfunction.

2. Referenced Procedures

21-25-02	Mid Electrical Service Center Exhaust Air Flow Sensor - Removal and Installation
21-25-08	Mid Electrical Service Center Exhaust Duct Check Valve - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Functional Test

(1) On Flight Engineers/Second Officers (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS - AIR - MON (L5).

(2) Locate MESC Exhaust Air Flow Sensor in aft left side of the MESC, zone 137, (Ref. Fig. 501).

(3) Remove MESC Exhaust Air Flow Sensor from ducting and temporarily stow in a safe place (Ref. 21-25-02).

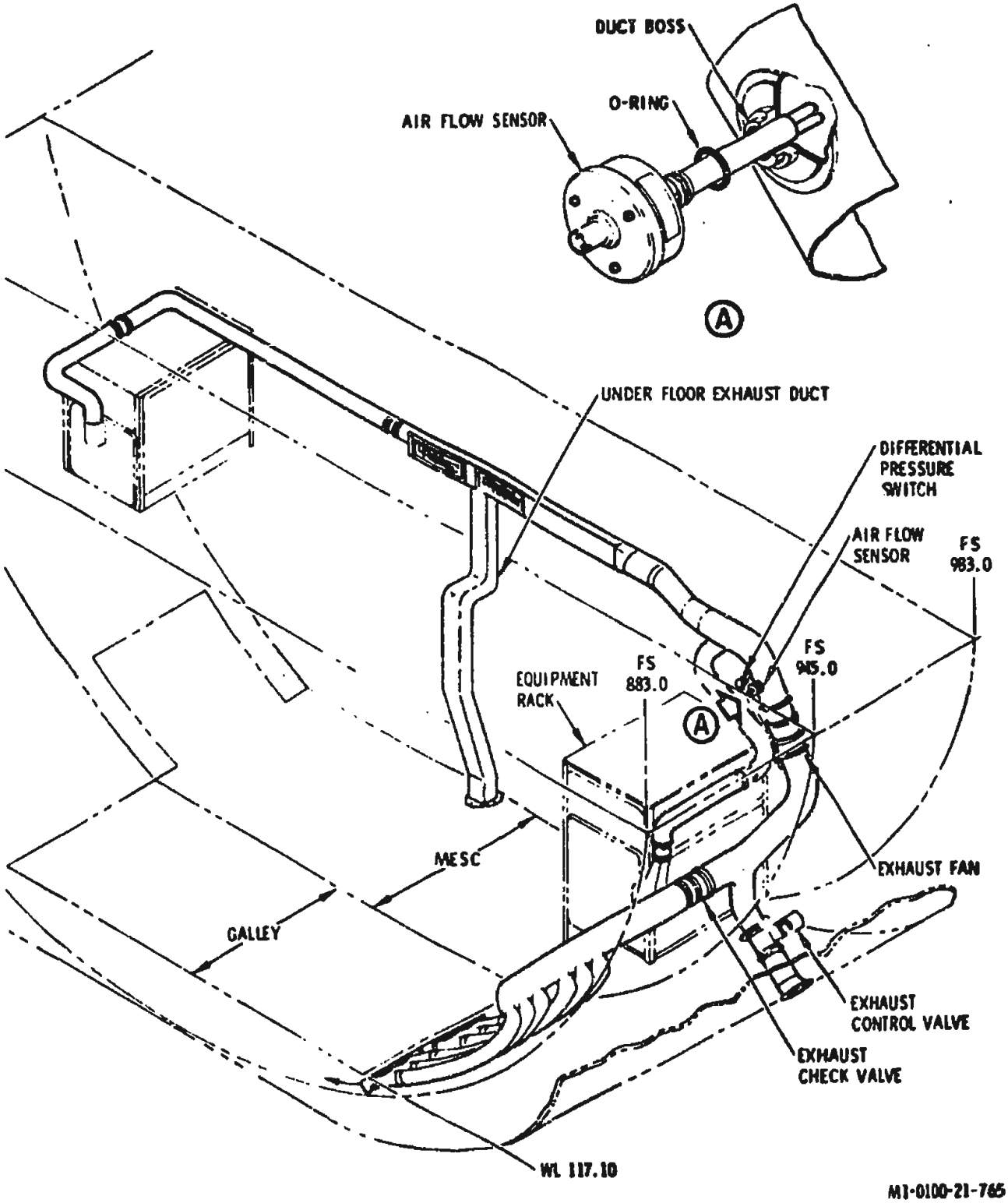
(4) Close circuit breaker opened in Step 3A(1).

(5) Close MESC Exhaust Flow Control Valve at FE/SO Console, ECS MONITOR panel, by depressing COOL AIR OVBD switchlight so it illuminates CLOSE.

(6) Place hand over MESC Exhaust Flow Sensor boss on duct. If air is being drawn into boss, check valve is OK, proceed to Step 7.

R If air is not being drawn into sensor boss on duct, replace MESC Exhaust Duct Check Valve, (Ref. 21-25-08).

R (7) Reinstall sensor.



R Mid Electrical Service Center Exhaust Duct Check Valve
R Test Locations
R Figure 501

EFFECTIVITY: ALL

R FORWARD ELECTRONIC SERVICE CENTER EXHAUST CONTROL VALVE -
R MAINTENANCE PRACTICES

R 1. General

R Close control of the exhaust control valve may be inoperative
R provided all FAA requirements are met.

R 2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

R A. FAA Requirements

R (1) All packs are operative.

R (2) MESC exhaust control valve is operative.

R B. Maintenance Practices

R (1) Verify all packs are operative.

R NOTE: This procedure assumes electrical power is on,
R pneumatic system is pressurized, and crossbleed
R valves are open.

R (a) Unlatch PACK FLOW CONTROL switchlight, flow bar
R ON.

R (b) Latch-in PACK FLOW CONTROL switchlight, flow bar
R OFF.

R (2) Verify MESC exhaust control valve is operative.

R (a) Verify AVIONIC AIR-MID-LO FLO light on FE/SO ECS
R MONITOR panel is off.

R (b) On FE/SO ECS MONITOR panel, unlatch COOL AIR OVBD
R switchlight. Verify CLOSE light comes on. Mid
R exhaust control valve must close, AVIONIC AIR MID
R OVBD light go off, and LO FLO light remain off.

R (c) Latch-in COOL AIR OVBD switchlight. Verify CLOSE
R light goes off. Exhaust control valve must open,
R AVIONIC AIR MID OVBD light come on, and LO FLO
R remain off.

FORWARD ELECTRONIC SERVICE CENTER EXHAUST CONTROL VALVE REMOVAL AND INSTALLATION

1. General

The exhaust control valve is located in the aft right side of the forward electronic service center, zone 112, (Ref. Fig. 401). Access is through access door 112AB.

2. Equipment and Materials

Protective caps

O-ring MS9068-259, or equivalent

3. Referenced Procedures

20-36-01	Single T-Bolt V-Band Clamps - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices
24-41-00	External Power - Maintenance Practices
32-63-00	Air/Ground Sensing - Maintenance Practices

4. Removal/Installation

CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL TO PREVENT FESC ELECTRONIC EQUIPMENT OPERATION WHILE FESC EXHAUST SYSTEM IS INOPERATIVE OR TURN ON GROUND SERVICE POWER (Ref. 24-41-00).

A. Removal

R (1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR - OVBD (J14).

(2) On FE/SO overhead circuit breaker panel CB2, zero 210, open and tag circuit breaker AVIONIC AIR MON (L5).

(3) On galley right circuit breaker panel, zone 137, open and tag circuit breaker FWD AVIONICS FAN (E14).

(4) Open access door 112AB.

(5) Disconnect electrical cable connector from control valve receptacle (Ref. Fig. 401).

(6) Install protective caps on cable connector and valve receptacle.

(7) Disconnect band clamp securing hose to upper (inlet) end of valve and slide clamp back onto duct.

(8) Disconnect T-bolt V-band coupling and remove O-ring at lower (discharge) end of valve. Slide coupling down onto duct below valve and discard O-ring.

(9) Support valve and remove mounting bolts.

(10) Work valve from hose and remove valve.

(11) Install protective caps on exposed duct and valve openings.

B. Installation

(1) Verify circuit breakers opened in Steps 4A(1) thru 4A(3) are open and tagged.

(2) Remove protective caps from duct and valve openings.

(3) Wipe duct and valve flanges clean and verify mating surfaces are undamaged. Repair or replace damaged components.

(4) Verify band clamp is on duct above valve installed position and T-bolt V-band connector on duct below.

(5) Position valve with flow arrow pointing overboard and valve actuator up.

(6) Work valve into hose on inlet duct and align valve between duct ends.

(7) Install new O-ring between valve and overboard duct flange and install T-bolt V-band coupling over valve and duct flanges and O-ring (Ref. 20-36-01).

(8) Install valve mounting bolts.

(9) Install band clamp securing hose to inlet end of valve.

(10) Remove protective caps and connect electrical connector to valve receptacle.

(11) Remove tags and close circuit breakers opened in Steps 4A(1) and 4A(2).

(12) Turn on electrical power (Ref. 24-00-00).

(13) On Flight Engineer/Second Officers ECS MONITOR panel, LO FLO legend in AVIONIC AIR - FWD advisory light must go off soon after FESC fan starts running.

5. Operational Check

(1) Verify AVIONIC AIR FWD, LO FLO light on Flight Engineer/Second Officers ECS MONITOR panel is off.

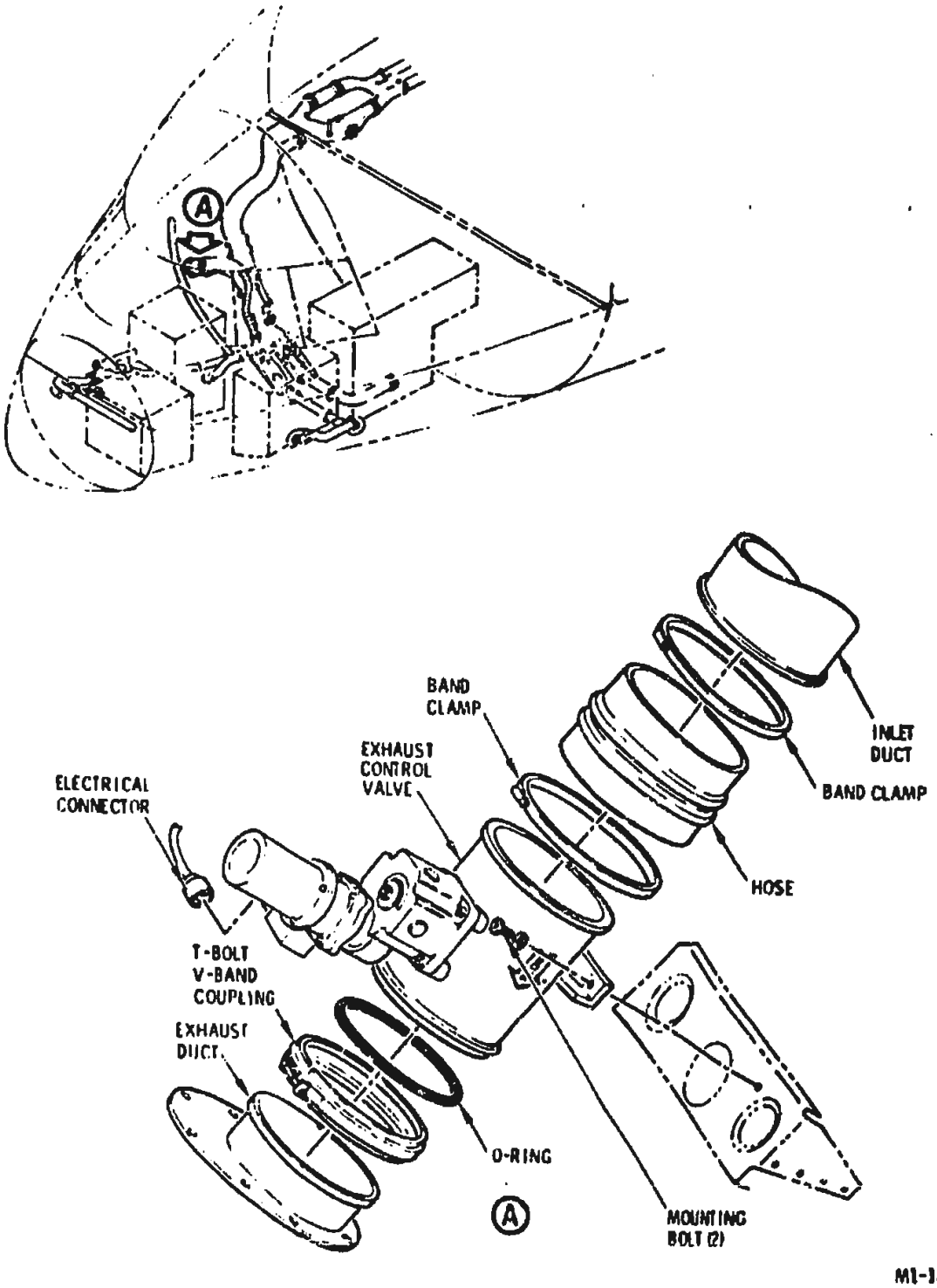
(2) On FE/SO ECS MONITOR panel, release COOL AIR OVBD switchlight. Verify CLOSE light comes on. FWD exhaust control valve must close, AVIONIC AIR FWD OVBD light goes off and LO FLO light remains off.

(3) Depress COOL AIR OVBD switchlight. Verify CLOSE light goes off. Exhaust control valve must open, AVIONIC AIR FWD OVBD light come on and LO FLO light remain off.

(4) Turn off electrical power (Ref. 24-00-00).

(5) Close FESC access door 112AB.

(6) Remove tag installed in Paragraph 4.



R Forward Electronic Service Center Exhaust Control Valve
R Removal and Installation
R Figure 401

R MID ELECTRICAL SERVICE CENTER (MESC) EXHAUST AIR FLOW CONTROL VALVE
R MAINTENANCE PRACTICES

R 1. General

R The AVIONIC AIR-MID-OVBD light on the FE/SO ECS MONITOR panel is
R normally on when the airplane is on the ground. This signifies
R that the Mid Electronics Service Center (MESC) Exhaust Control
R Valve is open and venting MESC avionics cooling air overboard.
R The MESC Exhaust Control Valve normally closes at liftoff. This
R procedure applies to an MESC Exhaust Control Valve with an
R inoperative close control function.

R 2. Deactivation

R NOTE: This deactivation procedure applies only when an aircraft
R is to be dispatched in accordance with the MEL.

R A. Confirm that MESC Exhaust Control Valve close control
R function is inoperative as follows:

R (1) Check that AVIONIC AIR-MID-OVBD light is on, then press
R and release (out) the COOL AIR OVBD CLOSE switchlight.

R (2) Confirm that AVIONIC AIR-MID-OVBD light remains on and
R CLOSE legend on switchlight comes on.

R (3) Press and latch (in) the COOL AIR OVBD CLOSE
R switchlight.

R (4) Confirm that the CLOSE legend on the switchlight goes
R off and AVIONIC AIR-MID-OVBD legend remains on.

R (5) Install placard on FE/SO ECS MONITOR panel, MESC
R EXHAUST CONTROL VALVE CLOSE FUNCTION INOPERATIVE,
R AVIONIC AIR-MID-OVBD LIGHT WILL REMAIN ON AFTER
R TAKEOFF.

R (6) Make appropriate entry in the aircraft log book.

MID ELECTRICAL SERVICE CENTER EXHAUST CONTROL VALVE REMOVAL AND INSTALLATION

1. General

R The Mid Electrical Service Center (MESC) exhaust control valve
R is located in the lower portion of the left cheek area outboard
R of the MESC, zone 139 (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

O-Ring, MS9068-250, or equivalent

Lock-wire, Fed Spec QQ-W-390, Cond A, 0.020-inch diameter, or equivalent

3. Referenced Procedures

R	6-40-00	Exterior Access Doors and Removable Panels
	20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
	24-00-00	Electrical Power - Maintenance Practices
	53-52-00	Wing to Fuselage Fairings - Description and Operation

4. Removal/Installation

R A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) ECS monitor
R panel to prevent MESC electronic equipment operation
R while MESC exhaust system is inoperative.

R (2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR OVBD (J14).

R On FE/SO overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AVIONICS AIR MON (L5).

R (3) On galley left circuit breaker panel, zone 137, open
R and tag circuit breaker FAN - AVIONICS RACK - MAIN
R (D14).

R (4) On aircraft 001-031 without SB53-099, remove left-hand main landing gear fairing 191F, FS 943 to FS 983 (Ref. 53-52-00).

R (4) On aircraft 001-031 with SB53-099, and 032-999, remove MESC Exhaust Valve access panel 191FA (Ref. 6-40-00) in left hand main landing gear fairing 191F, FS 943 to FS 983.

R (5) Disconnect electrical cable connector from exhaust valve receptacle (Ref. Fig. 401).

R (6) Install protective caps on cable connector and valve receptacle.

R (7) Carefully note position of eccentric shaped exhaust outlet, then remove clamp securing hose to lower end of valve.

R (8) Work hose from lower end of valve, and remove hose and exhaust outlet assembly.

R (9) Support valve and remove T-bolt coupling (Ref. 20-36-01) securing valve to fuselage mounted duct, and remove valve assembly. Remove and discard O-ring.

R (10) Install protective cap on duct opening.

B. Installation

R (1) Verify circuit breakers opened in Steps 4A(2) and 4A(3) are open and tagged.

(2) Remove protective cap from fuselage mounted duct.

(3) With valve flow arrow pointing downward and valve actuator pointing aft, install new O-ring between valve and fuselage mounted duct and install T-bolt coupling securing valve to duct (Ref. 20-36-01).

(4) Install hose and exhaust outlet assembly, working hose onto lower end of valve.

R (5) On aircraft 001-031 without SB53-099, rotate hose and exhaust outlet assembly to position noted in Step 4A(7) to assure proper mating with fairing and install clamp securing hose to valve.

R (5) On aircraft 001-031 with SB53-099 and 032-999, rotate hose and exhaust outlet assembly to position noted in Step 4A(7) to assure proper mating with MESC

R Exhaust Valve access panel 191FA and install clamp
R securing hose to valve.

(6) Remove protective caps and connect electrical cable to valve receptacle.

(7) Lock-wire cable connector.

R (8) Remove tags and close circuit breakers opened in Steps
R 4A(2) and 4A(3).

(9) Turn on electrical power (Ref. 24-00-00).

5. Operational Check

R (1) Verify AVIONIC AIR MID LO FLO light on FE/SO ECS MONITOR panel is off.

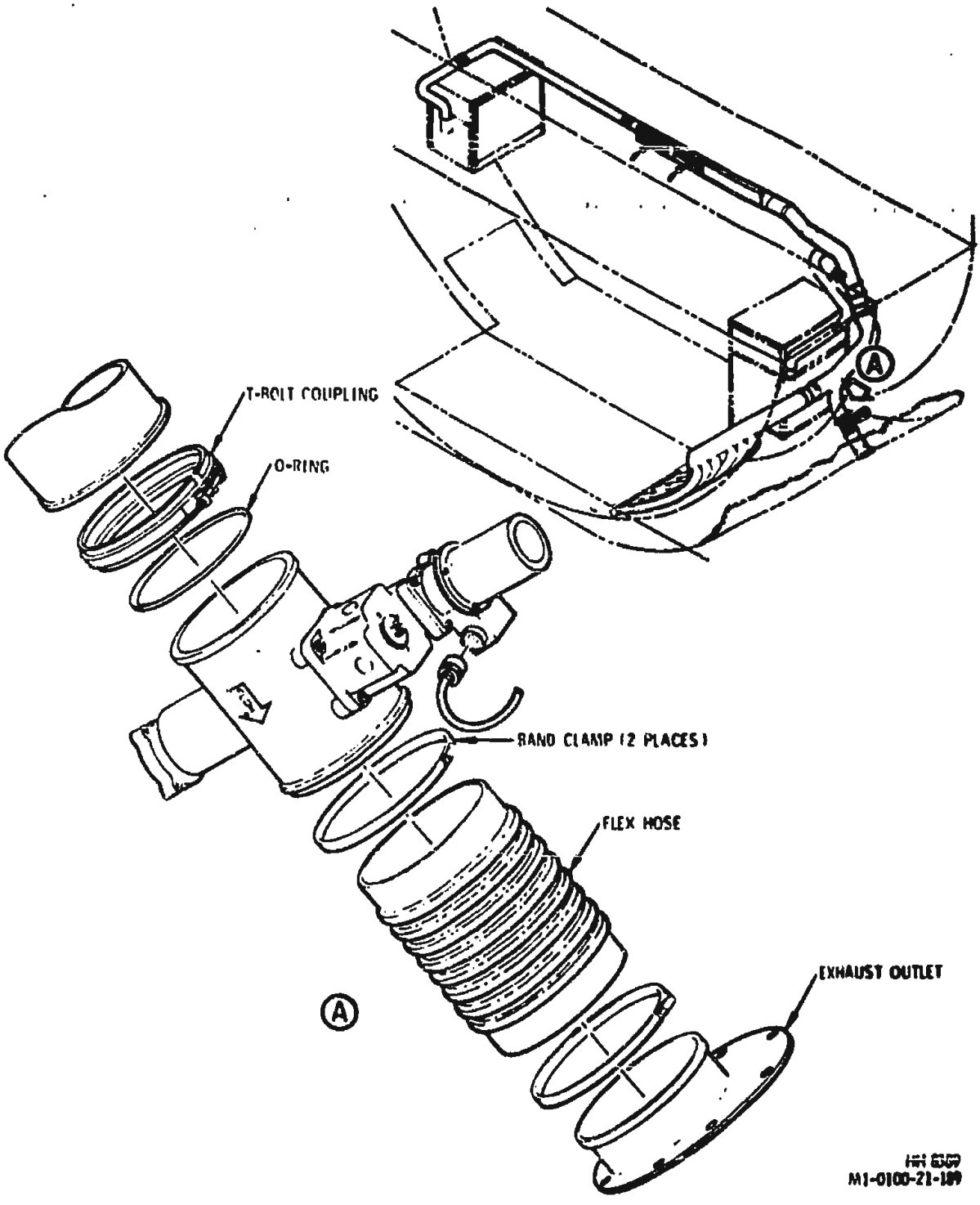
(2) On FE/SO ECS MONITOR panel, release COOL AIR OVBD switchlight. Verify CLOSE light comes on. Mid exhaust control valve must close and AVIONIC AIR MID OVBD light go off and LO FLO light remain off.

(3) Depress COOL AIR OVBD switchlight. Verify CLOSE light goes off. Exhaust control valve must open and AVIONIC AIR MID OVBD light come on and LO FLO light remain off.

(4) Turn off electrical power (Ref. 24-00-00).

R (5) Install exhaust outlet and panel removed in Step 4A(4).

R (6) Remove tag installed in Step 4A(1).



Mid Electrical Service Center Exhaust Control Valve
Removal and Installation
Figure 401

C C INERTIAL NAVIGATION COOLING SYSTEM
C C EXHAUST AIR FLOW SENSOR - REMOVAL AND INSTALLATION

C 1. General

C The air flow sensor is located in a duct in the forward right
C portion of the forward electronic service center (FESC), zone
C 112 (Ref. Figure 401). Access is through access door 112AB.

C 2. Equipment and Materials

C Protective caps and plugs.

C O-ring, MS9068-014, or equivalent.

C 3. Referenced Procedure

C 21-25-15 Inertial Navigation Cooling System Exhaust Air Flow
C Sensor - Adjustment and Test.

C 4. Removal/Installation

C A. Removal

C (1) On Flight Engineer/Second Officers aft circuit breaker
C panel CB3, zone 215, open and tag circuit breaker INS
C COOLING FAN - CONT (C19) and PWR (C21).

C (2) Open FESC access door 112AB.

C (3) Disconnect electrical cable connector from sensor
C receptacle.

C (4) Install protective caps on connector and receptacle.

C (5) Remove sensor and O-ring from exhaust duct fitting and
C discard O-ring.

C (6) Install protective plug into duct fitting.

C B. Installation

C (1) Verify circuit breaker opened in Step 4A(1) is open and
C tagged.

C (2) Remove protective plug from duct fitting.

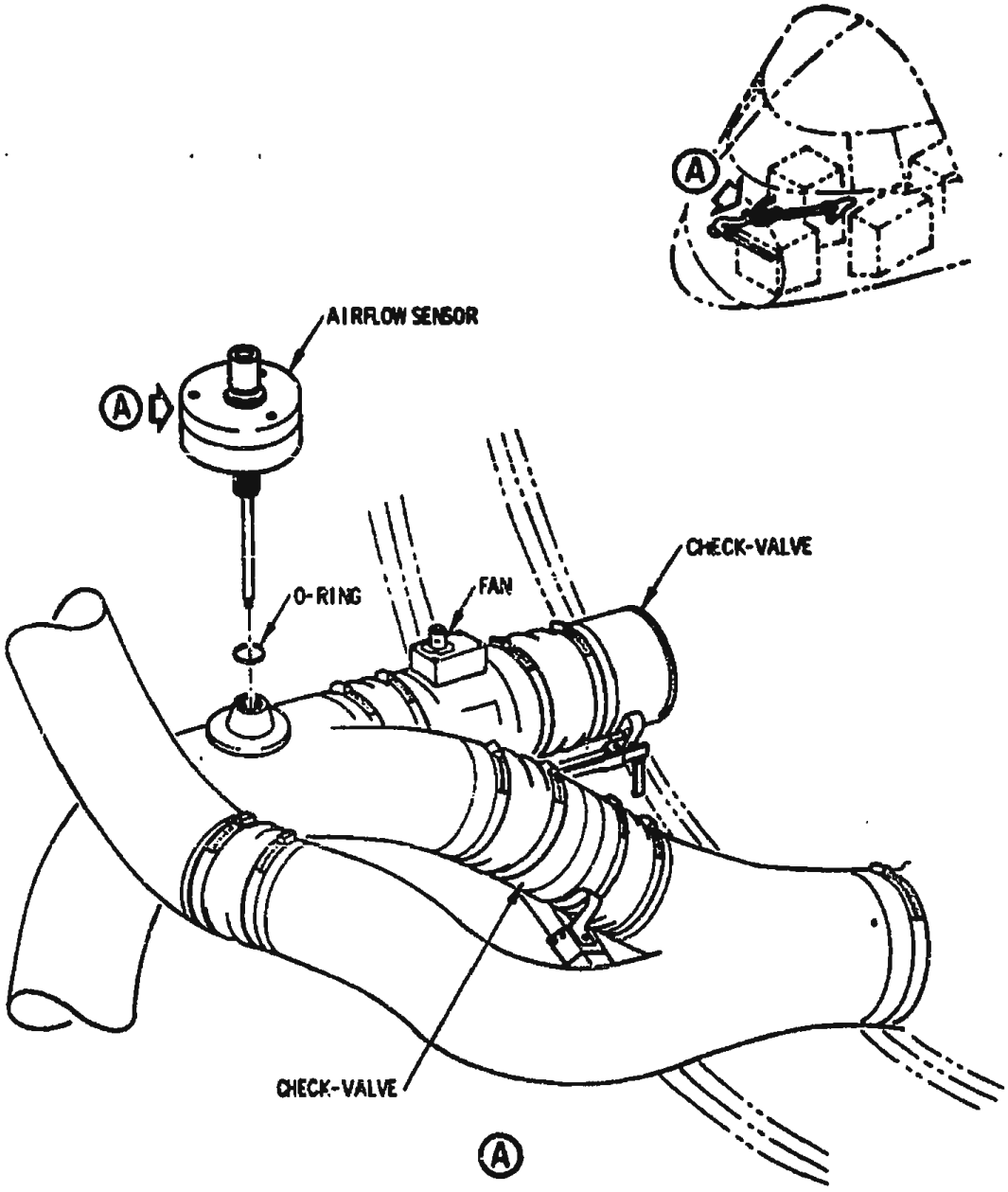
C (3) Install O-ring on sensor and sensor into duct fitting.

C (4) Remove protective caps and connect electrical cable
C connector to sensor receptacle.

C (5) Remove tag and close circuit breaker opened in Step
C 4A(1).

C (6) Verify sensor installation and operation by performing
C sensor operational test procedure (Ref. 21-25-15).

C (7) Close FESC access door 112AB.



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C Inertial Navigation Cooling System Exhaust Air Flow Sensor - Removal
C and Installation
C Figure 401

R INERTIAL NAVIGATION SYSTEM (INS) AIR FLOW SENSOR
R REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Protective caps (electrical connector)

R Protective plug (sensor boss)

O-ring, MS9068-014, or equivalent

R 2. Referenced Procedure

R 21-25-15 INS Cooling Air Flow Sensor - Adjustment and Test

R 3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breakers:

INS COOLING FAN - CONT (H6)

INS COOLING FAN - PWR (H8)

R (2) Disconnect electrical cable connector from sensor (Ref.
R Fig. 401).

R (3) Install protective caps on connector and sensor
R receptacle.

R (4) Using wrench on wrench flats, remove sensor and O-ring
R from duct and discard o-ring.

R (5) Install protective plug in sensor boss if new sensor is
R not going to be installed immediately.

B. Installation

R (1) Verify circuit breaker opened in Step 3A(1) is open and
R tagged.

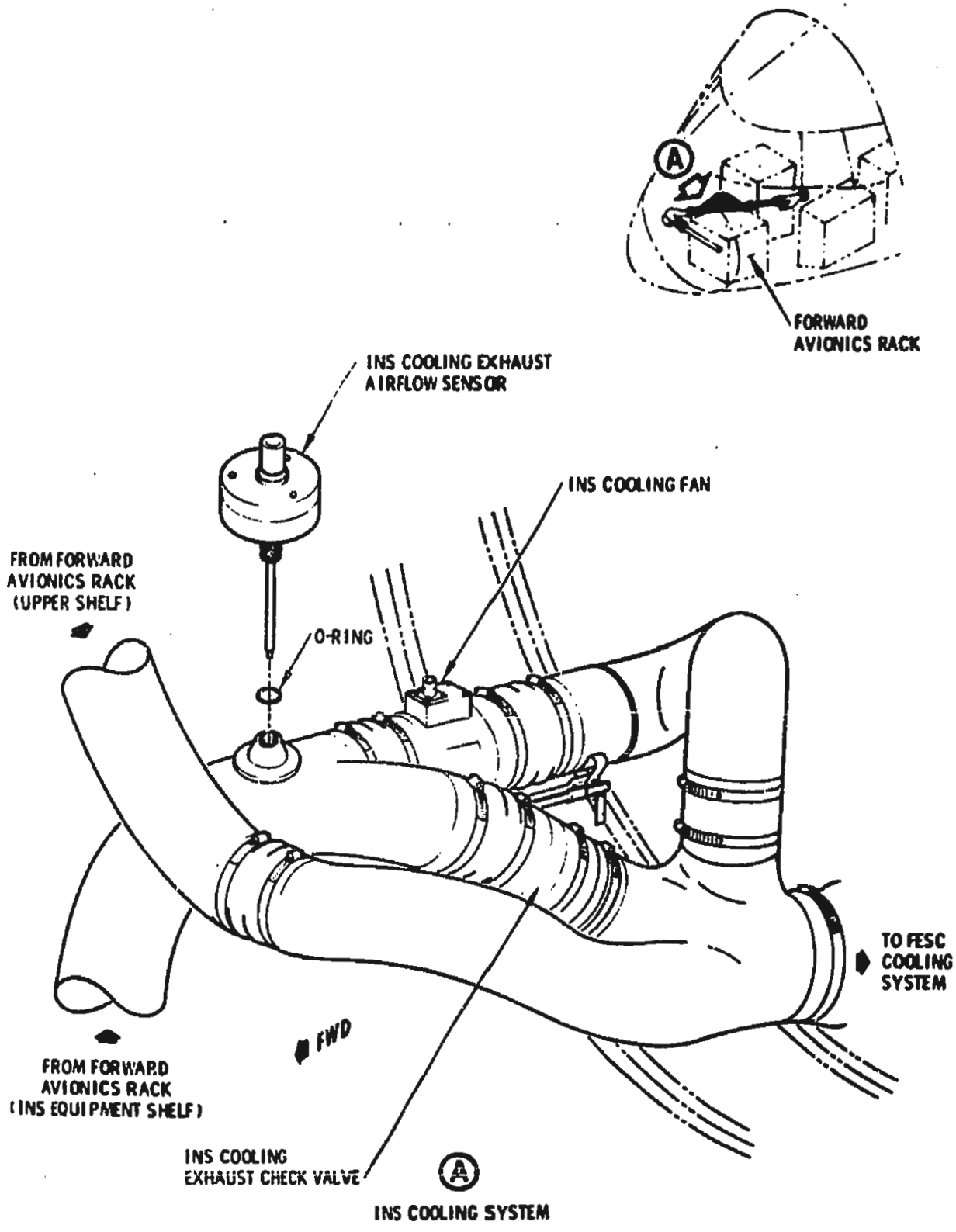
R (2) Remove protective plug from sensor boss, if installed.

R (3) Install new o-ring on sensc and using wrench on wrench
R flats, install sensor into duct (Ref. Fig. 401).

R (4) Remove protective caps and connect electrical connector
R to sensor.

R (5) Remove tag and close circuit breakers opened in Step
R 3A(1).

(6) Verify proper sensor installation and operation by
R performing sensor operational test (Ref. 21-25-15).



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R
R
R

INS Cooling Air Flow Sensor
Removal and Installation
Figure 401

EFFECTIVITY: 032-999

B

C C # INERTIAL NAVIGATION SYSTEM (INS) COOLING AIR FLOW SENSOR ADJUSTMENT AND TEST

C 1. General

C The INS Cooling Air Flow Sensor may not be adjusted or
C functionally tested in the aircraft. Those operations must be
C performed using overhaul shop test facilities. The following
C procedure verifies acceptable sensor operation in the aircraft.
C If sensor operation is not as detailed, replace sensor.

C 2. Referenced Procedure

C 24-00-00 Electrical Power - Maintenance Practices

C 3. Adjustment/Test

C A. Operational Test

C (1) On the galley right circuit breaker panel, zone 131,
C verify the following circuit breaker is closed:

C FWD - AVIONICS - FAN (14E)

C (2) On Flight Engineer/Second Officer (FE/SO) overhead
C circuit breaker panel CB2, verify the following circuit
C breakers are closed:

C INS - CONT (C19)

C INS - FAN (C21)

C (3) On FE/SO ECS MONITOR PANEL, release INS COOLING
C switchlight to the normal (out) position.

C (4) Turn on electrical power (Ref. 24-00-00).

C (5) Verify FESC exhaust fan is operating and exhaust flow
C control valve is open by checking for exhaust airflow
C from a 6 by 8-inch oval port in the lower right forward
C fuselage exterior, below the flight station windows.

C (6) On FE/SO ECS MONITOR panel, verify the following:

C (a) AVIONIC AIR - FWD indicator light: OVBD legend on,
C LO FLO legend off.

C CR (b) INS COOLING switchlight: ON legend off, LO FLO legend off.

C C CAUTION: DO NOT ALLOW FESC EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN 5 MINUTES.

C C (7) On galley right circuit breaker panel, open circuit breaker FWD - AVIONICS - FAN (14E).

C (8) Verify the following events occur, in sequence:

C C (a) AVIONIC AIR FWD indicator: LO FLO legend on (FESC fan stopped).

C (b) INS COOLING switchlight:

C LO FLO legend on.

C ON legend on (INS cooling fan on).

C LO FLO legend off.

C C (9) On FE/SO overhead circuit breaker panel CB2, open the following circuit breaker:

C INS - FAN (C21)

C (10) On FE/SO ECS MONITOR panel, verify the following:

C C (a) INS COOLING switchlight: ON legend on, LO FLO legend on.

C C (11) On galley right circuit breaker panel, close circuit breaker FWD - AVIONICS - FAN (14E).

C (12) On FE/SO ECS MONITOR panel, verify the following:

C C (a) AVIONIC AIR - FWD indicator light: LO FLO legend off (FESC fan operating).

C C (b) INS COOLING switchlight: LO FLO legend off, ON legend remains on.

C C (13) On FE/SO ECS MONITOR panel, cycle (depress and release) INS cooling switchlight and verify ON legend goes off.

C (14) Close circuit breaker opened in Step 3A(9).

C C C (15) Depress INS COOLING switchlight to the on (latched in) position. ON legend in switchlight must come on and INS cooling fan must run.

C (16) Release INS COOLING switchlight to normal (unlatched)
C position and verify the following:

C (a) INS COOLING switchlight: ON legend off, LO FLO
C legend off.

C (b) INS cooling fan stopped.

C (17) Turn off electrical power (Ref. 24-00-00).

INERTIAL NAVIGATION SYSTEM (INS) COOLING AIR FLOW SENSOR ADJUSTMENT AND TEST

1. General

The INS Cooling Air Flow Sensor may not be adjusted or functionally tested in the aircraft. Those operations must be performed using overhaul shop test facilities. The following procedure verifies acceptable sensor operation in the aircraft. If sensor operation is not as detailed, replace sensor.

NOTE: Allow 40 seconds for LO FLO legend to come on during test.

R 2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) On galley right circuit breaker panel, zone 131, verify circuit breaker FWD AVIONICS FAN (14E) is closed.

(2) On Flight Engineer/Second Officer (FE/SO) aft circuit breaker panel CB3, zone 215, verify circuit breakers INS COOLING FAN - CONT (H6) and - PWR (H8) are closed.

(3) On FE/SO ECS MONITOR panel, release INS COOLING switchlight to the normal (out) position.

(4) Turn on electrical power (Ref. 24-00-00).

(5) Verify Forward Electronic Service Center (FESC) exhaust fan is operating and FESC exhaust flow control valve is open by checking for exhaust airflow from a 6 by 8-inch oval port in lower right forward fuselage exterior, below the flight station windows.

(6) On FE/SO ECS MONITOR panel, verify the following:

(a) AVIONIC AIR - FWD indicator light: OVBD legend on, LO FLOW legend off.

(b) INS COOLING switchlight: ON legend off, LO FLO legend off.

NOTE: If the temperature in the FESC is above the close setting of the INS temperature control switch (70-80°F), the INS cooling fan may already be on. If so, the switch must be cooled with Freon to perform test (Ref. Figure 501).

R

CAUTION: DO NOT ALLOW FESC EXHAUST FAN TO BE INOPERATIVE ANY LONGER THAN 5 MINUTES.

(7) On galley right circuit breaker panel, open circuit breaker FWD AVIONICS FAN (14E).

(8) Verify the following events occur in sequence:

(a) AVIONIC AIR - FWD indicator: LO FLO legend on (FESC fan stopped).

(b) INS COOLING switchlight:

LO FLO legend on.

ON legend on (INS cooling fan on).

LO FLO legend off.

(9) On FE/SO aft circuit breaker panel CB3, open circuit breaker INS COOLING FAN - PWR (H8)

(10) On FE/SO ECS MONITOR panel, verify the following:

(a) INS COOLING switchlight: ON legend remains on, LO FLO legend on.

(11) On galley right circuit breaker panel, close circuit breaker FWD AVIONICS FAN (14E).

(12) On FE/SO ECS MONITOR panel, verify the following:

(a) AVIONIC AIR - FWD indicator light : LO FLO legend off (FESC fan operating).

(b) INS COOLING switchlight: LO FLO legend off, ON legend remains on until INS COOLING switchlight is pressed (latched in) and then released (unlatched) at which time ON legend goes off.

(13) Close circuit breaker INS COOLING FAN - PWR (H8).

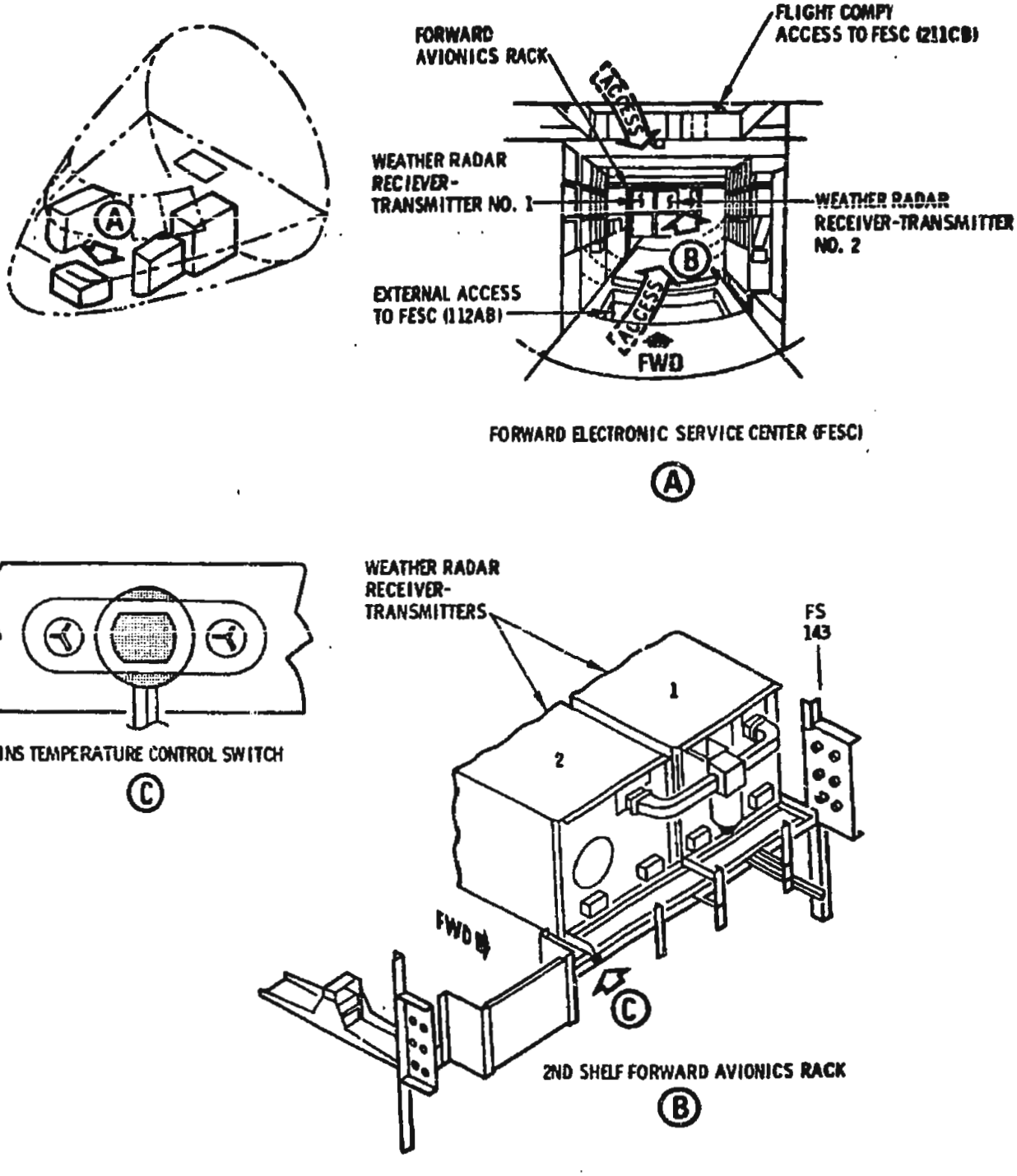
(14) Press INS COOLING switchlight to the on (latched in) position. ON legend in switchlight must come on and INS cooling fan must operate.

(15) Release INS COOLING switchlight to normal (unlatched) position and verify the following:

(a) INS COOLING switchlight: ON legend off, LO FLO legend off.

(b) INS cooling fan stopped.

(16) Turn off electrical power (Ref. 24-00-00).



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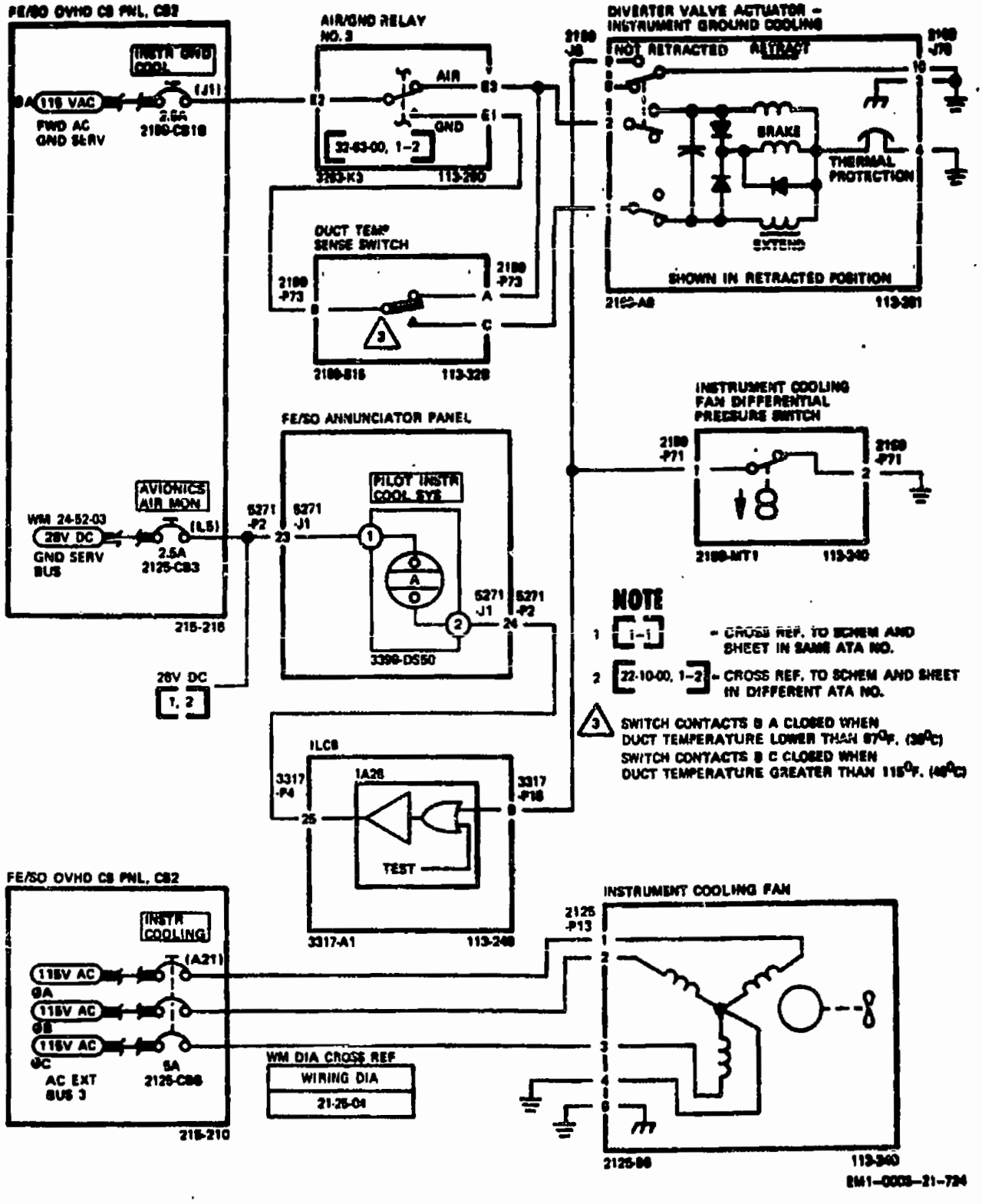
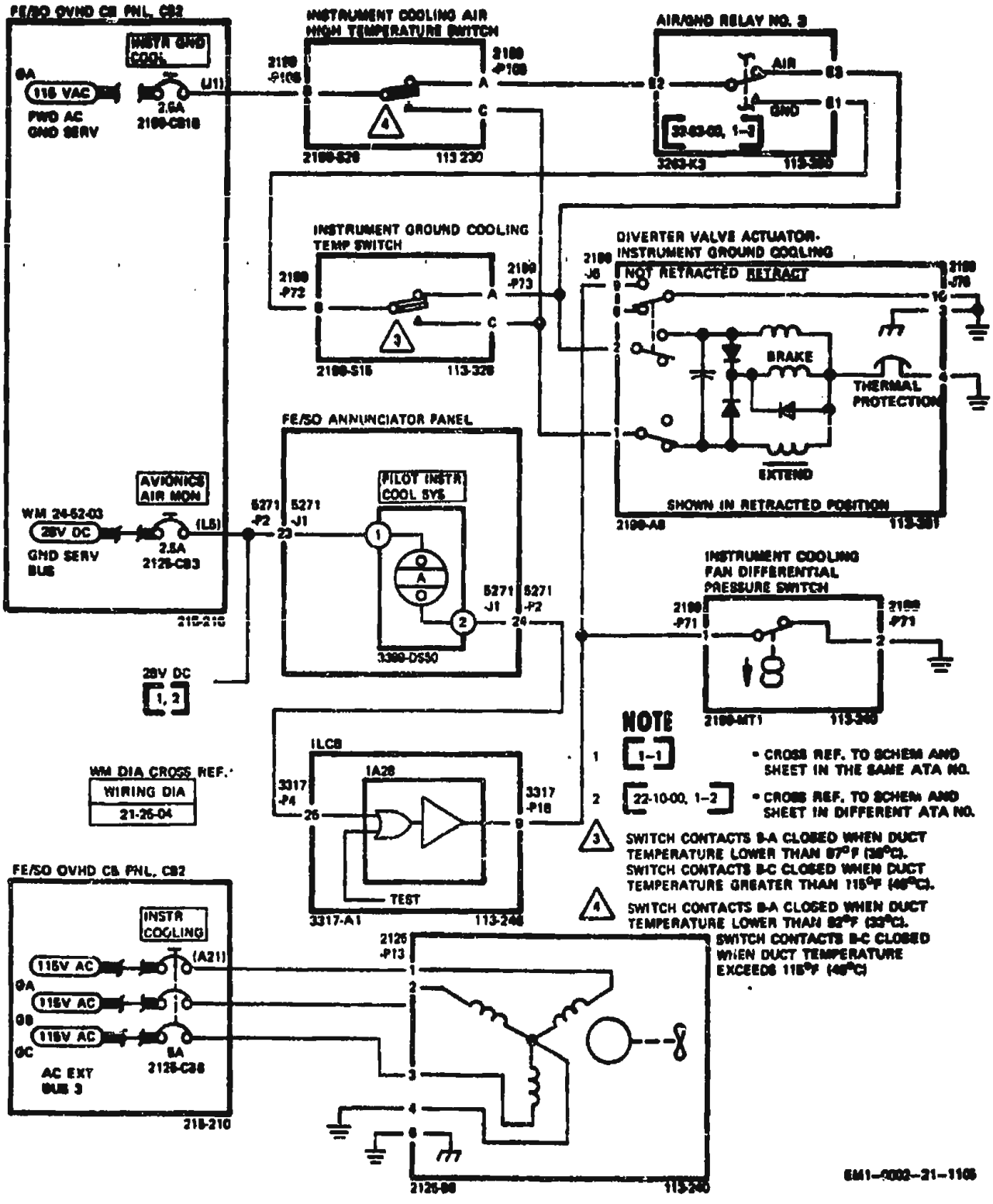
INS Temperature Control Switch Location
Figure 501



R Schematic - Flight Station Instrument Coding System
R Figure 502

R EFFECTIVITY: 032-036 WITHOUT SB21-154



R Schematic - Flight Station Instrument Cooling System
R Figure 502

R EFFECTIVITY: 032-036 WITH SB21-154

C C INERTIAL NAVIGATION COOLING SYSTEM EXHAUST CHECK VALVES REMOVAL AND INSTALLATION

C 1. General

C The two check valves in the INS cooling system are both located C in the forward right side of the forward electronic service C center (FESC), zone 112 (Ref. Figure 401). Removal and C installation procedures are the same for both valves. Access is C through access door 112AB.

C 2. Equipment and Materials

C Protective caps.

C 3. Referenced Procedures

C 21-25-00 Forward Electronic and Mid Electrical Service C Center Exhaust Systems - Adjustment and Test.

C 4. Removal/Installation

C CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS ECS MONITOR PANEL C TO PREVENT FESC ELECTRONIC EQUIPMENT OPERATION WHILE C INS COOLING SYSTEM CHECK VALVE IS INOPERATIVE

C A. Removal

C (1) Open FESC access door 112AB.

C (2) Remove band clamps securing hose(s) to valve.

C (3) Support the valve and remove the mounting bolts.

C (4) Work hose(s) from valve and remove valve from mounting C support.

C (5) Install protective cap(s) on duct openings.

C B. Installation

C (1) Remove protective cap(s) from duct openings.

C (2) Work hose(s) over each end of valve.

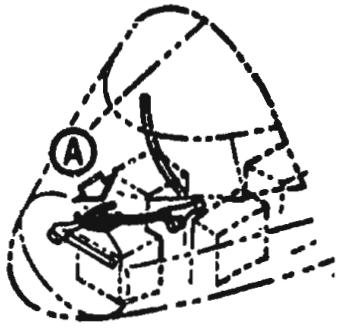
C (3) Position valve and install mounting bolts.

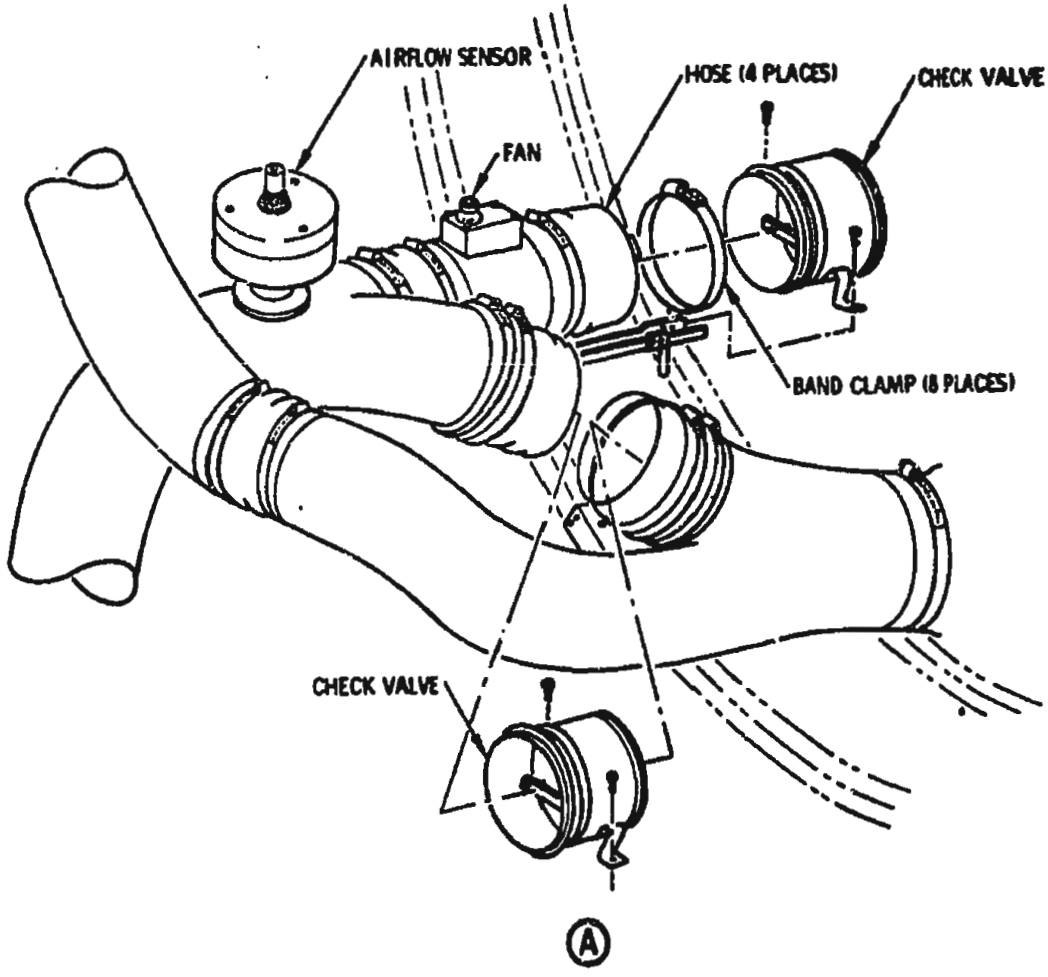
C (4) Install band clamps securing hose(s) to valve.

C (5) Remove tag installed in Step 4.

C (6) Verify check valve operation by performing pertinent
C portion of FESC exhaust system test (Ref. 21-25-00).

C (7) Close FESC access door 112AB.





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C Inertial Navigation Cooling System Exhaust Check Valve - Removal and
C Installation
C Figure 401

R EFFECTIVITY: 018-031
R

001B

R

INERTIAL NAVIGATION SYSTEM (INS) COOLING SYSTEM CHECK VALVE REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (ducting)

2. Referenced Procedures

21-25-00	Forward Electronic Service Center Cooling System - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal

(1) Turn off electrical power (Ref. 24-00-00).

(2) Remove band clamps securing hose(s) to valve.

(3) Support valve and remove mounting bolts.

(4) Slide hose(s) loose from valve and remove valve from mounting support.

(5) Install protective cap(s) on duct openings.

B. Installation

(1) Remove protective cap(s) from duct opening(s).

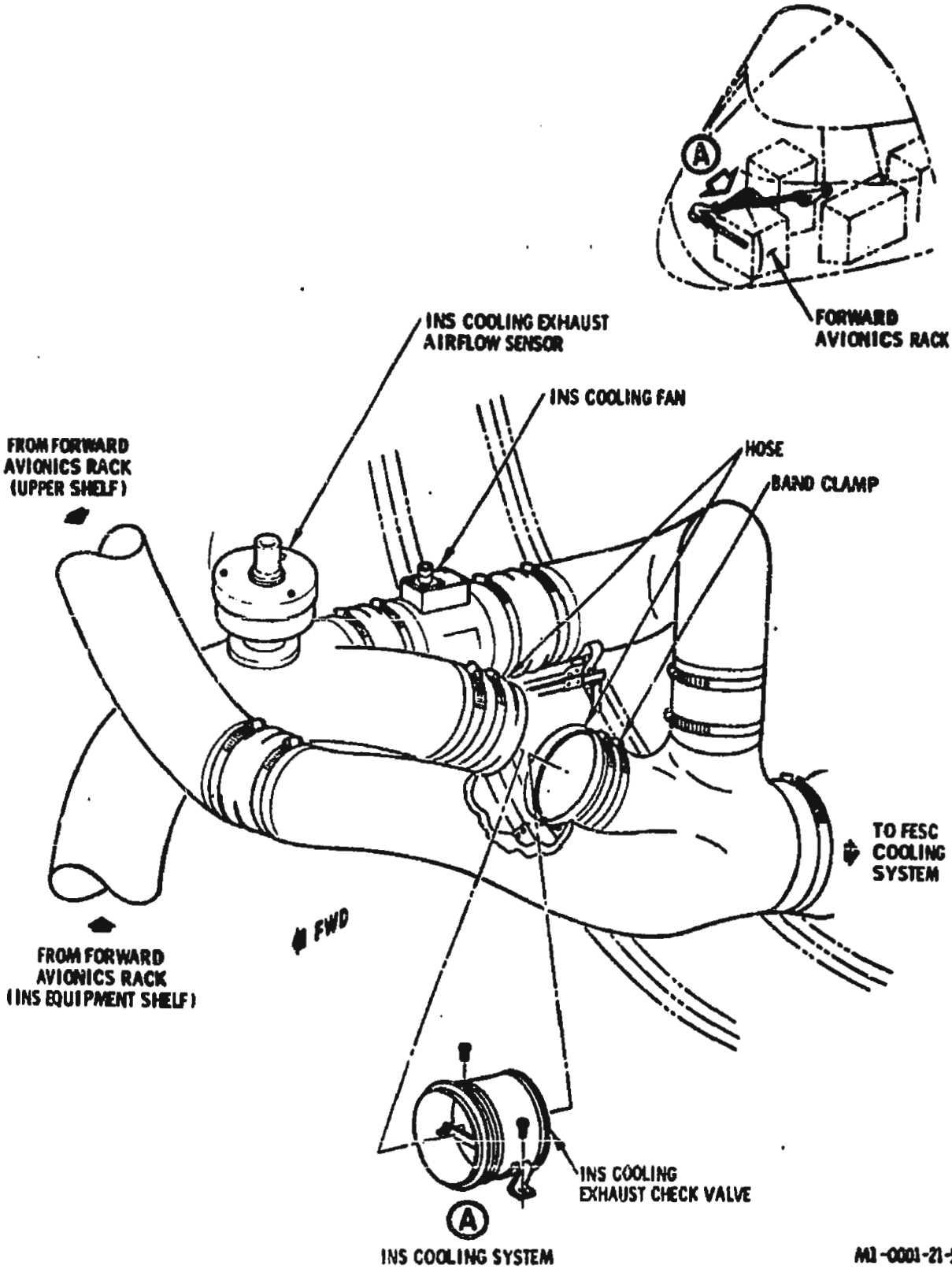
(2) Slide hose(s) onto end(s) of valve.

(3) Position check valve with flow arrow pointing aft and install mounting bolts.

(4) Install band clamps securing hose(s) to valve.

(5) Turn on electrical power (Ref. 24-00-00).

(6) Verify proper check valve operation by performing pertinent portion of FESC cooling system test (Ref. 21-25-00).



R
R
R
INS Cooling System Exhaust Check Valve
Removal and Installation
Figure 401

C C INERTIAL NAVIGATION COOLING SYSTEM EXHAUST FAN
C REMOVAL AND INSTALLATION

C 1. General

C The exhaust fan is located in the forward right side of the
C forward electronic service center (FESC), zone 112 (Ref. Figure
C 401). Access is through access door 112AB.

C 2. Equipment and Materials

C Protective caps.

C 3. Referenced Procedures

C 24-00-00 Electrical Power - Maintenance Practices

C 4. Removal/Installation

C CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS MONITOR PANEL TO
C PREVENT FESC ELECTRONIC EQUIPMENT OPERATION WHILE INS
C COOLING SYSTEM EXHAUST FAN IS INOPERATIVE

C A. Removal

C (1) ON Flight Engineer/Second Officers aft circuit breaker
C panel CB3, zone 215, open and tag circuit breaker INS
C COOLING FAN - PWR (C21).

C (2) Open FESC access door 112AB.

C (3) Disconnect electrical cable connector from fan
C receptacle.

C (4) Install protective caps on cable connector and fan
C receptacle.

C (5) Remove band clamps securing hose to each end of fan.

C (6) Support the fan and remove the mounting bolts.

C (7) Work hoses from each end of fan and remove fan from
C mounting support.

C (8) Install protective caps on duct openings.

C B. Installation

C (1) Verify circuit breaker opened in Step 4A(1) is open and
C tagged.

C (2) Remove protective caps from duct openings.

C (3) Work hoses over each end of fan.

C (4) Position fan and install mounting bolts.

C (5) Install band clamps securing hoses at each end of fan.

C (6) Remove protective caps and connect electrical cable
C connector to fan receptacle.

C (7) Remove CAUTION tag installed in Step 4.

C (8) Remove tag and close circuit breaker opened in Step
C 4A(1).

C (9) Turn on electrical power (Ref. 24-00-00).

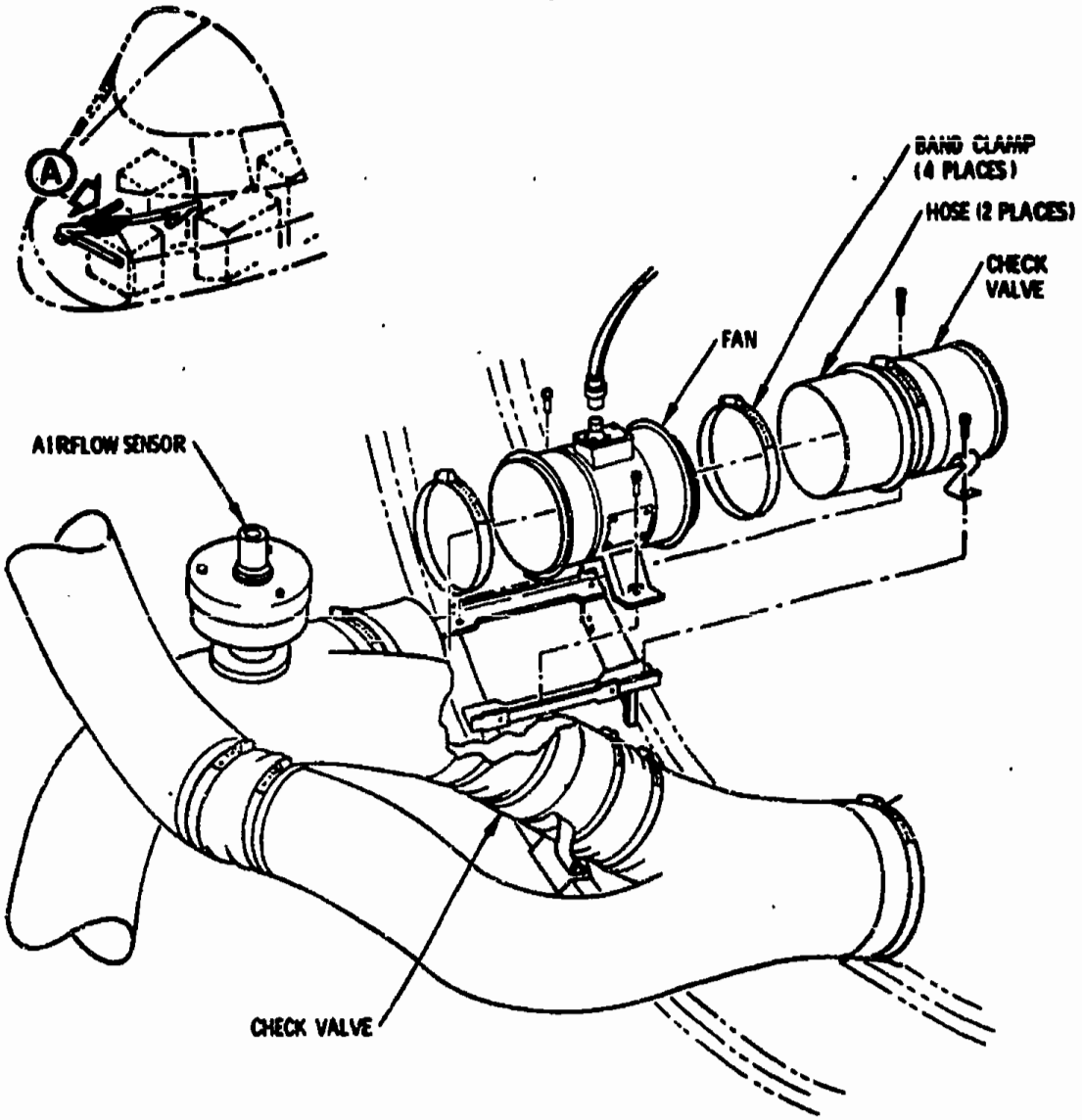
C (10) Verify fan installation and operation as follows:

C (a) On Flight Engineer/Second Officers ECS MONITOR
C panel, zone 215, depress INS COOLING switchlight
C to on (latched position). ON legend in
C switchlight must come on, and INS cooling fan must
C run.

C (b) Release INS COOLING switchlight to normal (out)
C position. ON legend in switchlight must go off
C and INS cooling fan must stop.

C (11) Turn off electrical power (Ref. 24-00-00).

C (12) Close FESC access door 112AB.



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C Inertial Navigation Cooling System Exhaust Fan - Removal and
C Installation
C Figure 401

R EFFECTIVITY: G18-031
R

R # INERTIAL NAVIGATION SYSTEM (INS) COOLING FAN REMOVAL AND INSTALLATION

R 1. Equipment and Materials

Protective caps (electrical connector)

Protective covers (ducting)

R 2. Referenced Procedures

R 24-41-00 Electrical Power/Ground Service System - Maintenance Practices

R 3. Removal/Installation

A. Removal

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag circuit breaker INS COOLING FAN - PWR (H8).

R (2) On FE/SO ELECTRICAL panel, select GND SERVICE for aircraft electrical power (Ref. 24-41-00).

R (3) Disconnect electrical cable connector from fan (Ref. Fig. 401).

(4) Install protective caps on cable connector and fan receptacle.

(5) Remove band clamps securing hoses to each end of fan.

(6) Slide hoses loose from each end of fan and remove fan.

(7) Install protective covers on duct openings.

B. Installation

R (1) Verify circuit breaker opened in Step 3A(1) is open and tagged.

(2) Remove protective covers from duct openings.

(3) Slide hoses onto each end of fan.

(4) Position fan with flow arrow pointing aft.

(5) Install band clamps securing hoses at each end of fan.

R (6) Remove protective caps and connect electrical cable connector to fan.

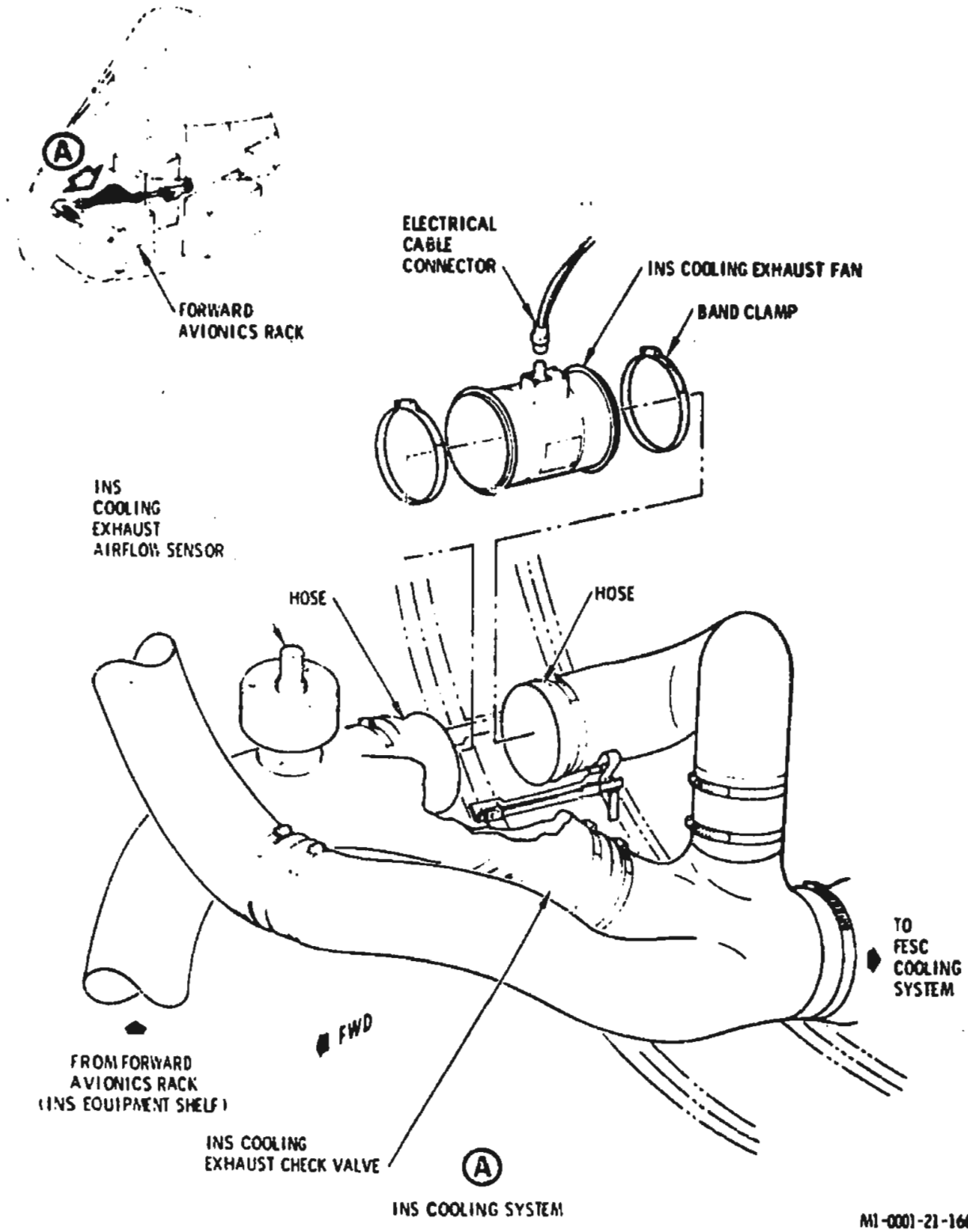
R (7) Remove tag and close circuit breaker opened in Step R 3A(1).

R (8) Turn on full service electrical power (Ref. 24-41-00).

R (9) Verify proper fan installation and operation as follows:

(a) On FE/SO ECS MONITOR panel, zone 215, depress INS COOLING switchlight to on (latched position). ON legend in switchlight must come on, and INS cooling fan must run.

R (b) Release INS COOLING switchlight to normal (out) position. ON legend in switchlight must go off and INS cooling fan must stop.



R R R INS Cooling Fan
Removal and Installation
Figure 401

EFFECTIVITY: 032-999

INS TEMPERATURE CONTROL SWITCH - REMOVAL AND INSTALLATION

R 1. Equipment and Materials

Contact insertion and removal tool LAC PN L525C19-475 or equivalent

Soldering Gun

Heat Gun

R 2. Referenced Procedures

MM 34-44-01 Weather Radar Receiver/Transmitter - Removal and Installation

WM 20-11-08 Non-Environmental Terminal Module - Maintenance Practices

WM 20-00-05 Soldering Procedures and Requirements for the L-1011 Aircraft - Standard Practices

R 3. Removal/Installation

CAUTION: DO NOT OPERATE INERTIAL NAVIGATION SYSTEM WHILE INS COOLING SYSTEM IS INOPERATIVE.

A. Removal

(1) On FE/SO aft circuit breaker panel CB3, open and tag circuit breakers:

INS COOLING FAN - CONT (H6)

INS COOLING FAN - PWR (H8)

R (2) On the forward avionics rack, upper shelf, remove
R weather radar receiver - transmitters (Ref. MM
R 34-44-01).

R (3) Remove screws from temperature control switch and
R remove from rack (Ref. Fig. 401).

R (4) Locate terminal module rail 3444-TB2 (Ref. Fig. 401)
R and remove wire 2125-46P from terminal 2125-30A and
R wire 2125-50R from terminal 2125-31A (Ref. WM
R 20-11-08).

R (5) Place temperature control switch on suitable work bench.

NOTE: Tag wires to identify wire to pin 1 and wire to pin 2 for correct installation on new switch.

R (6) Unsolder wires at pins 1 and 2 of switch and remove
R (Ref. WM 20-00-05).

R (7) Resolder wires to pins 1 and 2 of new switch.

B. Installation

R (1) Verify circuit breakers opened in Step 3A (1) are open and tagged.

(2) Install temperature control switch behind second shelf of forward avionics rack (Ref. Fig. 401).

(3) Connect wire 2125-46P to terminal 2125-30A and wire 2125-50R to terminal 2125-31A on terminal module rail 3444-TB2.

R (4) Remove tags and close circuit breakers opened in Step
R 3A(1).

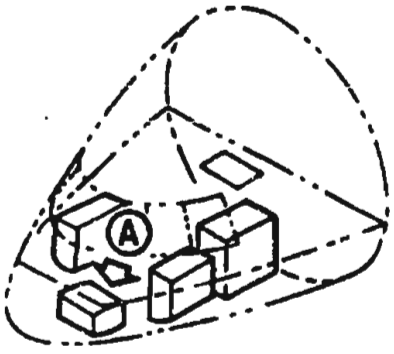
(5) Verify proper operation of INS temperature control switch as follows:

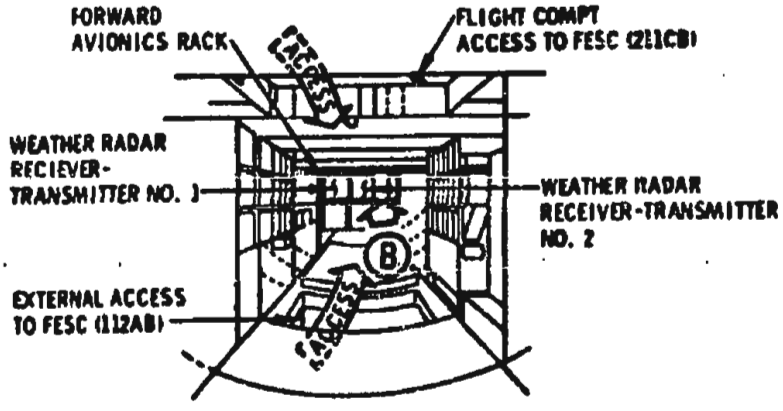
(a) Raise temperature of switch using heat gun.

(b) On FE/SO ECS MONITOR panel, verify ON legend in INS COOLING switchlight illuminates and INS cooling fan is operating.

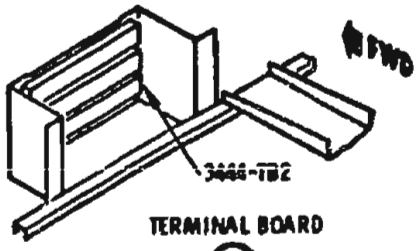
(c) When temperature cools below close setting of
R switch, ON legend in switchlight must go off and
R fan must stop.

(6) Install weather radar receiver - transmitters (Ref. MM 34-44-01).

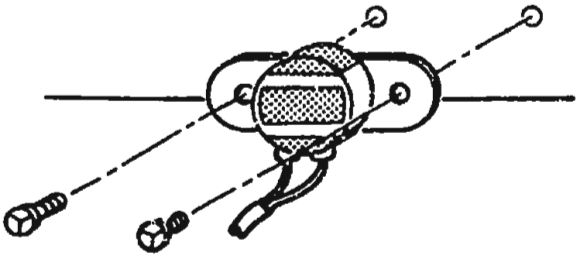



FORWARD AVIONICS RACK
FLIGHT COMPT ACCESS TO FESC (211CB)
WEATHER RADAR RECIEVER-TRANSMITTER NO. 1
WEATHER RADAR RECEIVER-TRANSMITTER NO. 2
EXTERNAL ACCESS TO FESC (112AB)
B

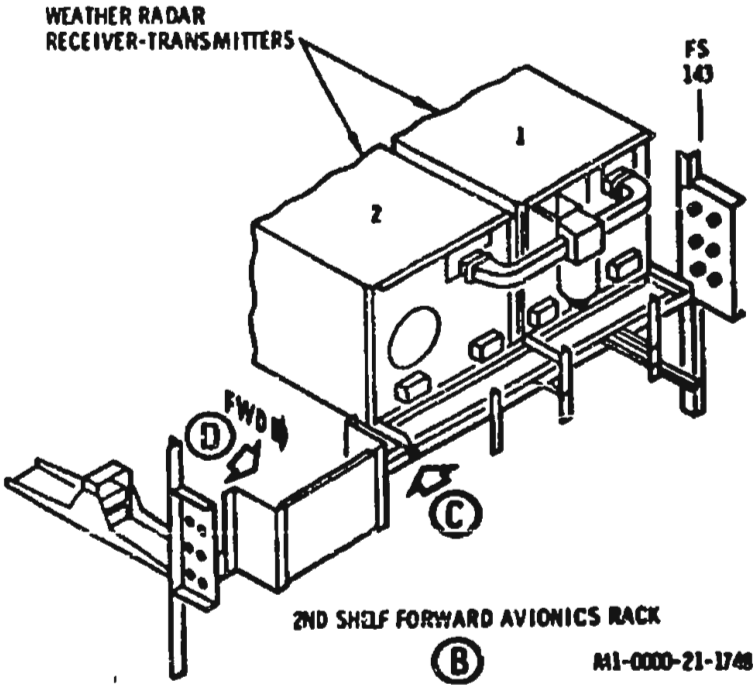
FORWARD ELECTRONIC SERVICE CENTER (FESC)
(VIEW LOOKING FWD)
(A)

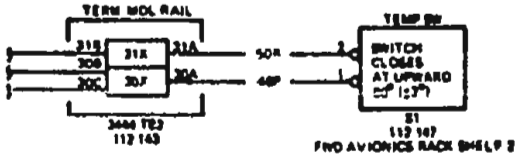


(D)



INS TEMPERATURE CONTROL SWITCH
(C)





M1-0000-21-1748

R INS Temperature Control Switch
R Removal and Installation
R Figure 401

R R

INSTRUMENT COOLING FAN REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

Protective covers (ducting)

2. Referenced Procedures

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On FE/SO ELECTRICAL panel, zone 215, select GND SERVICE for aircraft electrical power (Ref. 24-41-00).

(2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker INSTR COOLING (A21).

(3) Disconnect electrical cable connector from fan receptacle.

R (4) Install protective caps on electrical cable connector and fan.

R R (5) Loosen clamp at forward end of fan and remove from fan (Ref. Fig. 401).

(6) Support fan and remove bolts from fan mounting flanges.

(7) Slide fan out of duct line.

(8) Install protective covers on duct openings.

B. Installation

(1) Verify circuit breaker INSTR COOLING (A21) on CB2 panel is open and tagged.

(2) Remove protective covers from duct.

(3) Install fan in duct line with flow arrow pointing forward.

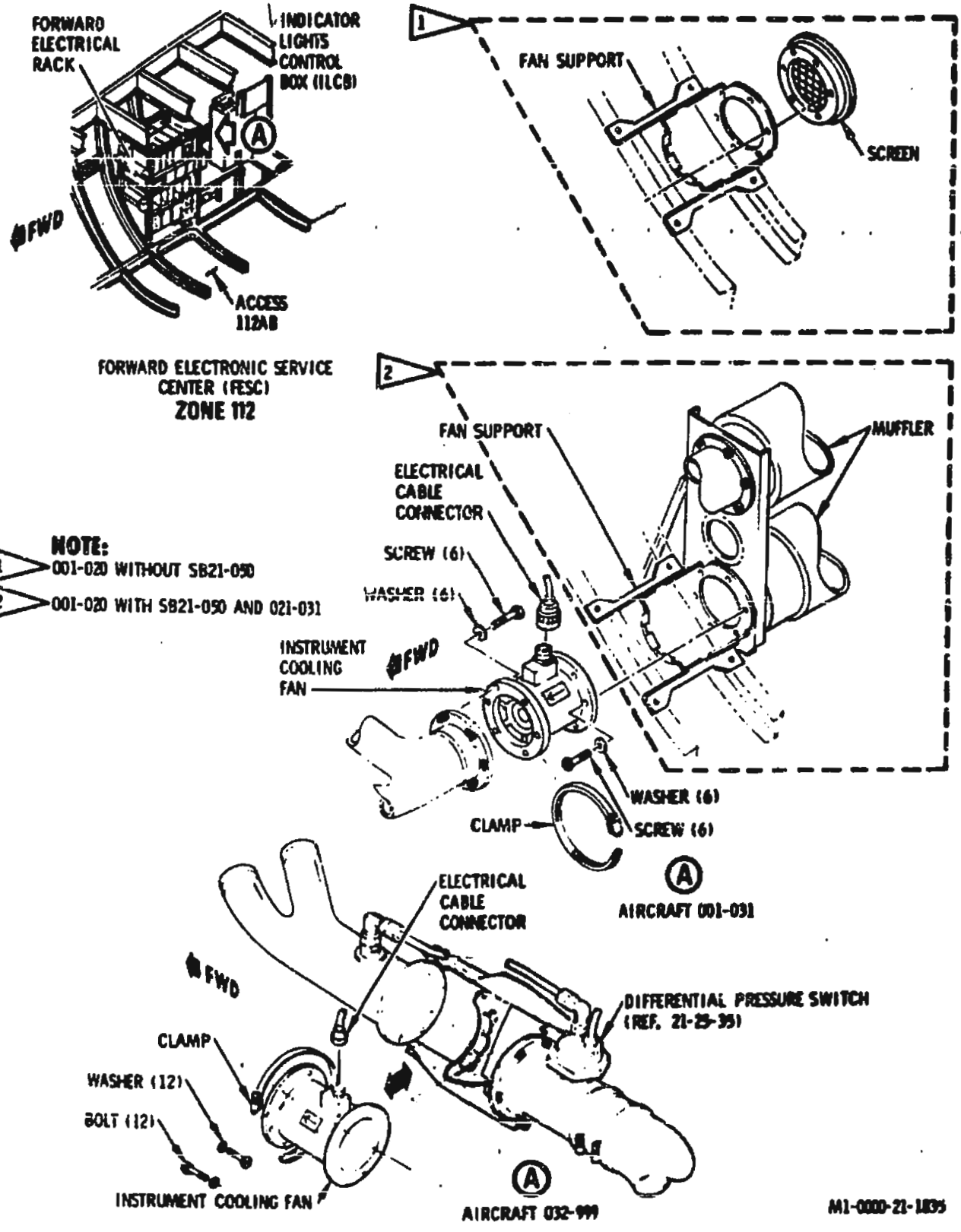
(4) Install bolts in fan mounting flanges and tighten.

(5) Install clamp around fan, slide over support clips and tighten.

(6) Remove protective caps and connect electrical cable connector to fan receptacle.

(7) Remove tag and close circuit breaker INSTR COOLING (A21) opened in Step 3A(2).

(8) Turn on full service electrical power (Ref. 24-41-00) and verify fan is operating.



Instrument Cooling Fan
Removal and Installation
Figure 401

EFFECTIVITY: ALL

R BATTERY COOLING FAN
R REMOVAL AND INSTALLATION

R 1. Equipment and Materials

Protective caps (electrical connectors)

Protective covers (ducting)

R 2. Referenced Procedures

24-41-00 External Power/Ground Service System - Maintenance Practices

R 3. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officer (FE/SO) ELECTRICAL
R panel, select GND SERVICE bus for aircraft electrical
R power (Ref. 24-00-00).

(2) On FE/SO aft circuit panel CB3, open and tag circuit breaker:

BAT - CHG (A15)

R (3) Disconnect electrical cable connector from fan (Ref.
R Fig. 401).

R (4) Install protective caps on electrical cable connector
R and fan receptacle.

R (5) Support fan and remove bolts from both fan mounting
R flanges.

R (6) Slide fan out of duct line.

R (7) Install protective covers on duct openings.

B. Installation

R (1) Verify circuit breaker opened in Step 3A(2) is open and tagged.

(2) Remove protective covers from duct.

(3) Install fan in duct line with flow arrow pointing inboard.

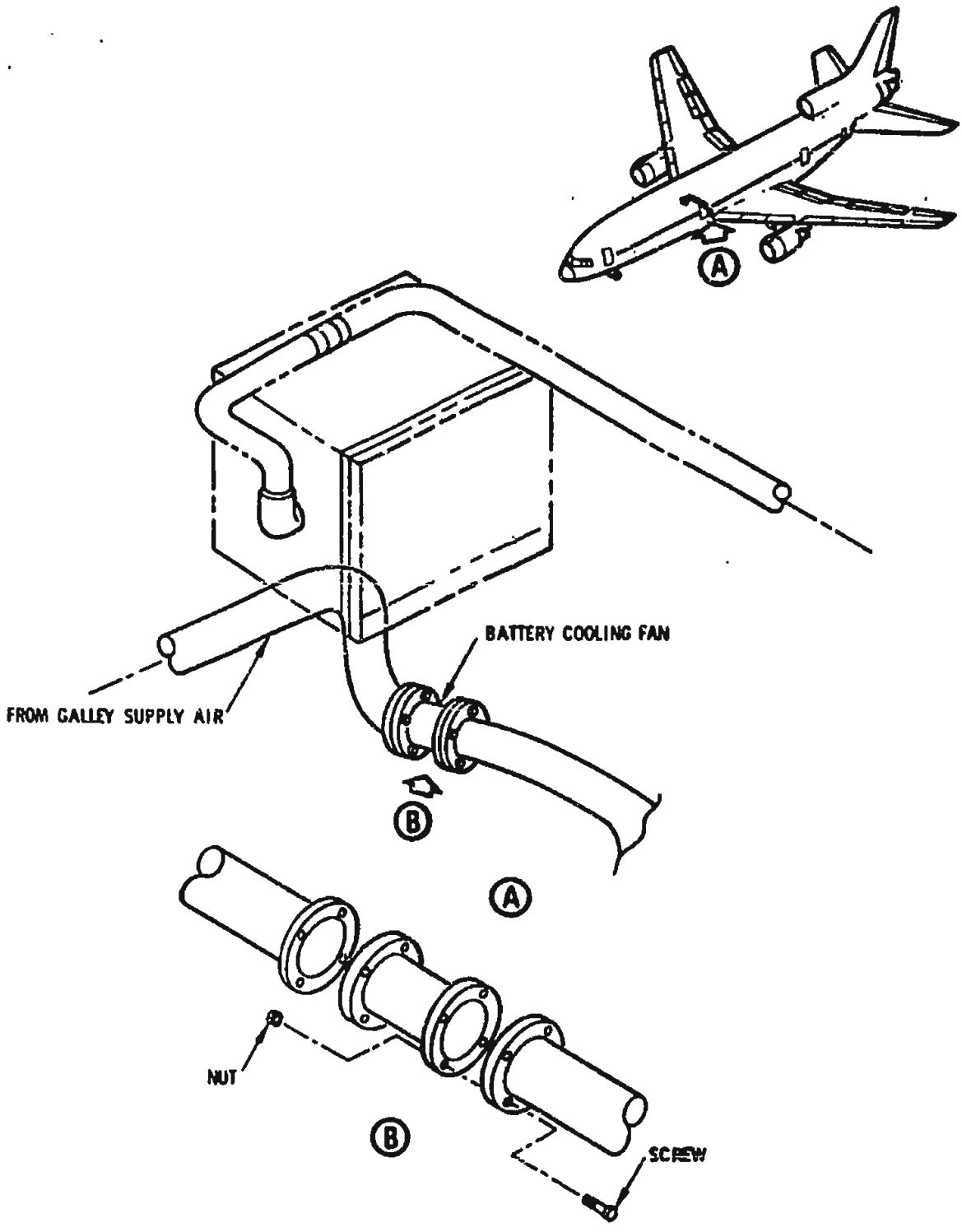
R (4) Install bolts in fan mounting flanges and tighten.

(5) Remove protective caps and connect electrical connector to fan.

R (6) Turn on full service electrical power (Ref. 24-00-00).

R (7) Remove tag and close circuit breaker opened in Step
R 4A(2).

R (8) Verify fan is oeprating.



M1-57200-21-797

R Battery Cooling Fan
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

R R

BATTERY COOLING THERMAL SWITCH REMOVAL AND INSTALLATION

R 1. Equipment and Materials

Protective caps (electrical connectors)

Protective plug (threaded duct opening)

R 2. Referenced Procedures

21-25-00	Battery Cooling System - Functional Test
6-50-00	Interior Access Doors and Removable Panels

R 3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breaker BAT - CHG (A15).

(2) Remove galley access panels 135HL and 135JL (Ref. 6-50-00).

R R (3) Remove electrical cable connector from switch (Ref. Fig. 401).

(4) Install protective caps on electrical cable connector and switch receptacle.

(5) Remove switch from duct.

NOTE: Air will be coming from opening with switch removed from duct and air conditioning operating.

(6) Install protective plug in threaded duct opening if the new switch is not to be installed immediately.

B. Installation

(1) Verify circuit breaker BAT - CHG (A15) on CB3 panel, is open and tagged.

(2) Remove protective plug from threaded duct opening, if installed.

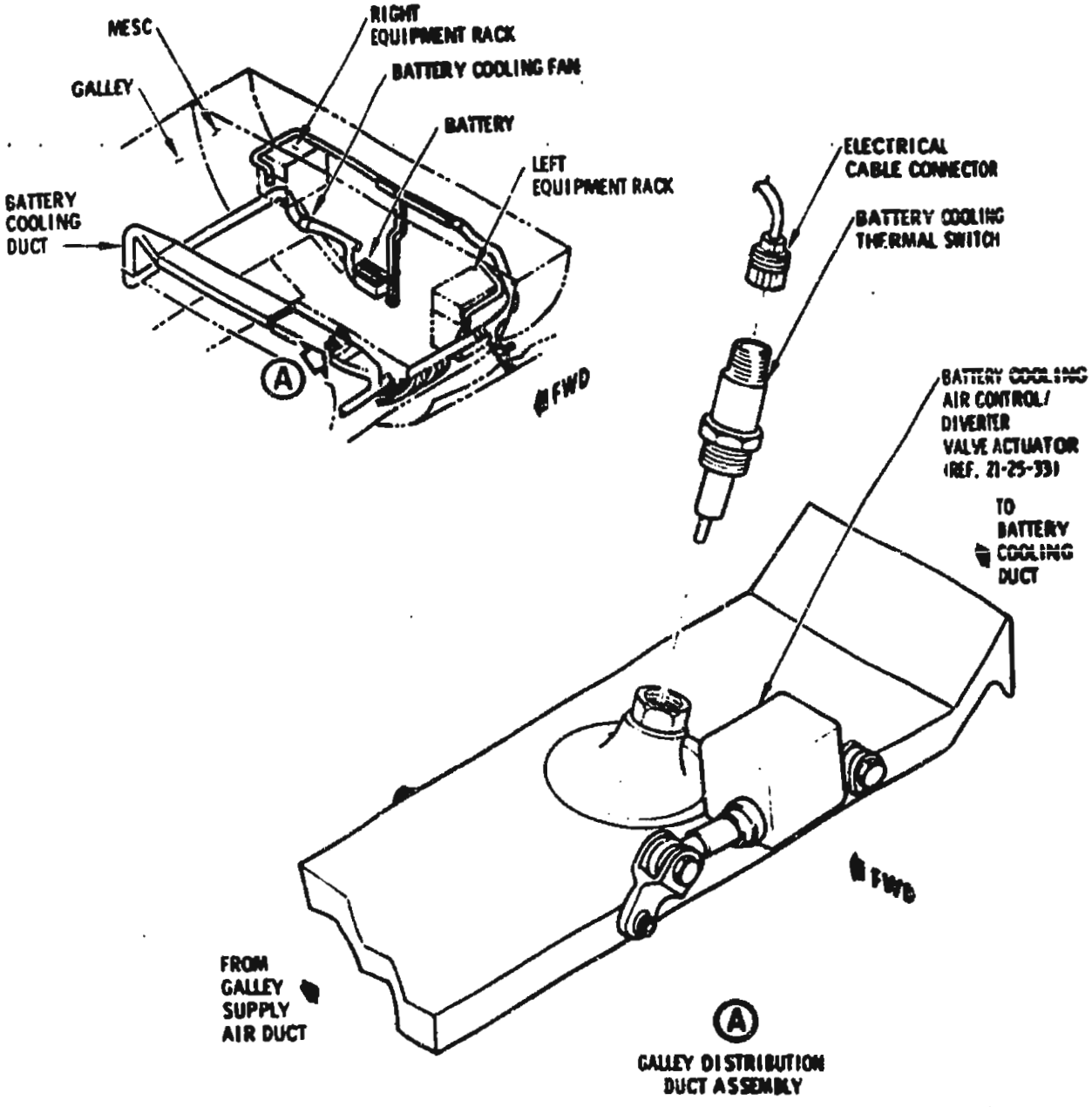
R (3) Install new switch into duct opening (Ref. Fig. 401).

R (4) Remove protective caps and connect electrical cable connector to switch.

(5) Remove tag and close circuit breaker BAT - CHG (A15).

(6) Verify proper thermal switch operation by performing Battery Cooling System Functional Test (Ref. 21-25-00).

R (7) Install access panels 135HL and 135JL removed in Step
R 3A(2).



M1-1011-21-395

R Battery Cooling Thermal Switch
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

0018

FORWARD ELECTRONIC SERVICE CENTER EXHAUST CONTROL VALVE ACTUATOR REMOVAL AND INSTALLATION

1. General

The exhaust control valve actuator is located in the aft right side of the forward electronic service center, zone 112. Access is through access door 112 AB. Actuator is mounted on the exhaust valve (Ref. 21-25-09).

2. Equipment and Materials

Protective Caps

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

32-63-00 Air/Ground Sensing - Maintenance Practices

4. Removal/Installation

R A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) ECS monitor
R panel to prevent FESC electronic equipment operation
R while FESC exhaust system is inoperative.

R (2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR OVBD (J14).

R (3) On galley right circuit breaker panel, zone 137, open and tag circuit breaker FWD AVIONICS FAN (E14).

R (4) Open access door 112AB.

R (5) Disconnect electrical cable connector from actuator
R receptacle (Ref. Fig. 401).

R (6) Install protective caps on cable connector and actuator
R receptacle.

R (7) Remove four screws (Ref. Fig. 401) and separate actuator assembly from endbell and valve housing.

B. Installation

R (1) Verify circuit breakers opened in Steps 4A(2) and 4A(3) are open and tagged.

(2) With actuator assembly and valve butterfly in open position, assemble actuator assembly to endbell and housing with actuator crank (Ref. Fig. 401) engaging slot in valve housing. Install screws but do not tighten.

(3) Cycling butterfly from full open to full closed position, move actuator assembly and endbell on loose screws to allow free and full movement of butterfly. Tighten screws to a torque of 16 to 20 pound-inches.

(4) Remove protective caps and connect electrical connector to actuator receptacle.

R (5) Remove tags and close circuit breakers opened in Steps
R 4A(2) and 4A(3).

(6) Turn on electrical power (Ref. 24-00-00).

(7) On Flight Engineer/Second Officers ECS MONITOR panel, AVIONIC AIR FWD LO FLO light must go off soon after FESC fan starts.

5. Operational Check

(1) Verify AVIONIC AIR FWD, LO FLO light on Flight Engineer/Second Officers ECS MONITOR panel is off.

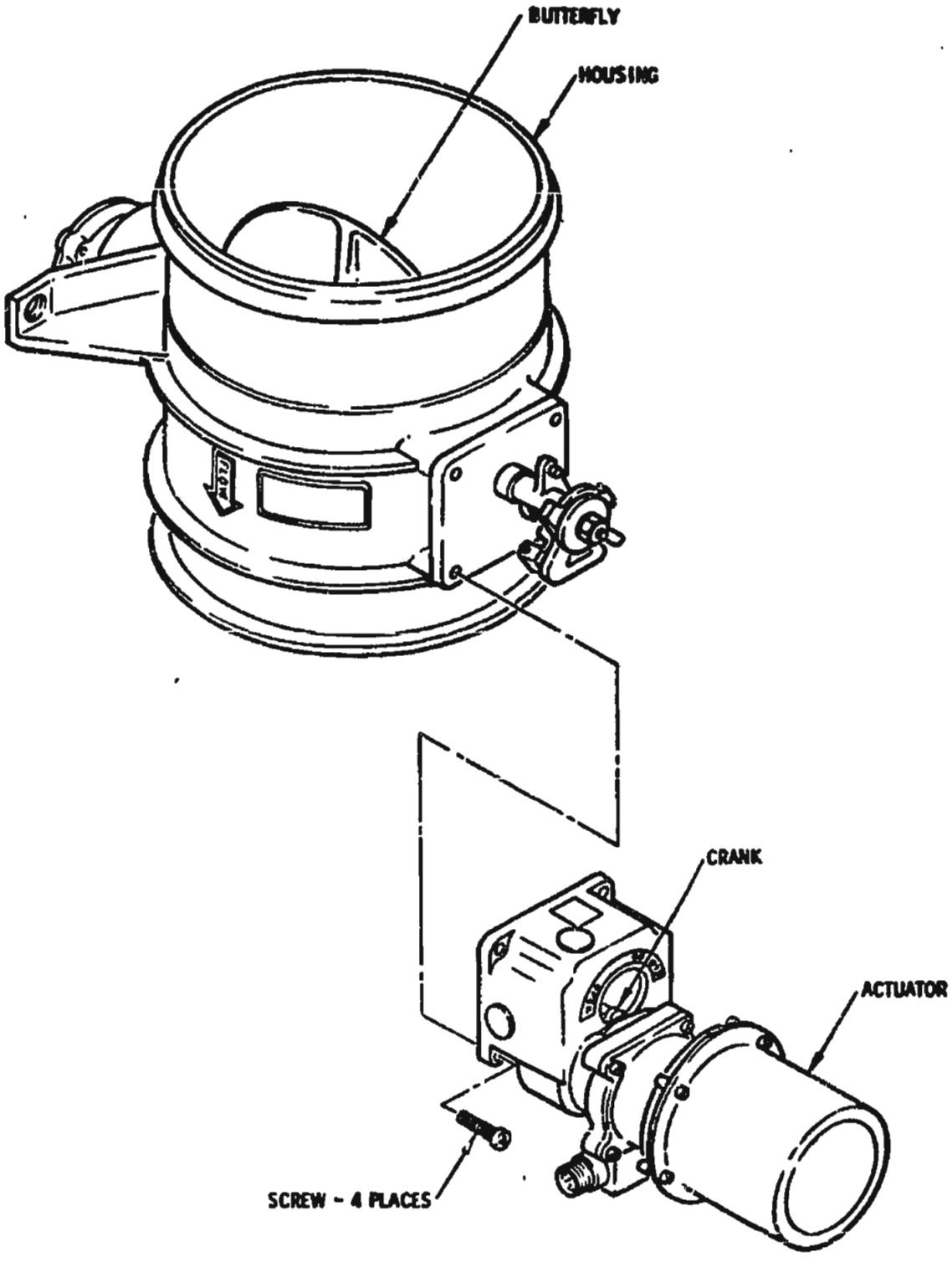
(2) Place aircraft in simulated gear up (airborne) condition (Ref. 32-63-00).

(3) On Flight Engineer/Second Officers ECS MONITOR panel, release COOL AIR OVBD switchlight to the close (out) position. FWD exhaust control valve must close and CLOSE light comes on. AVIONIC AIR FWD, OVBD light goes off and FWD LO FLO light remains off.

(4) Depress COOL AIR OVBD switchlight to normal (latched in) position. Exhaust control valve must open and CLOSE light goes off. AVIONIC AIR FWD OVBD light comes on and FWD LO FLO light remains off.

(5) Remove aircraft from simulated gear up (airborne) condition (Ref. 32-63-00) and verify FWD OVBD light remains on.

(6) Turn off electrical power (Ref. 24-00-00).



M1-0100-21-390

R FESC Exhaust Control Valve Actuator
R Removal and Installation
R Figure 401

R (7) Close FESC access door 112AB.

R (8) Remove tag installed in Step 4.

MID ELECTRICAL SERVICE CENTER EXHAUST CONTROL VALVE ACTUATOR REMOVAL AND INSTALLATION

1. General

The Mid Electrical Service Center (MESC) exhaust control valve actuator is located in the lower portion of the left cheek area outboard of the mid electrical service center, zone 139. The actuator is mounted on the exhaust control valve (Ref. 21-25-10).

2. Equipment and Materials

Protective Caps

3. Referenced Procedure

6-40-00	Exterior Access Doors and Removable panels
24-00-00	Electrical Power - Maintenance Practices
32-63-00	Air/Ground Sensing - Maintenance Practices
53-52-00	Wing to Fuselage Fairings - Description and Operation

4. Removal/Installation

A. Removal

(1) Tag Flight Engineer/Second Officers (FE/SO) ECS monitor panel to prevent MESC electronic equipment operation while MESC exhaust system is inoperative.

(2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breaker AIR OVBD (J14).

(3) On galley left circuit breaker panel, zone 137, open and tag circuit breaker FAN - AVIONICS RACK - MAIN (D14).

R (4) On aircraft 001-031 without SB53-099, removeleft-hand main landing gear fairing 191F, FS943 to RS983 (Ref. 53-52-00).

(4) On aircraft 001-031 with SB53-099 and 032-999, remove MESC Exhaust Valve access panel 191FA (Ref.

R 6-40-00) in left hand main landing gear fairing 191F,
R FS943 to FS983.

(5) Disconnect electrical cable connector from actuator receptacle (Ref. Fig. 401).

(6) Install protective caps on cable connector and actuator receptacle.

(7) Remove four screws (Ref. Fig. 401) and separate actuator assembly from endbell and valve housing.

B. Installation

R (1) Verify circuit breakers opened in Steps 4A(2) and 4A(3) are open and tagged.

(2) With actuator assembly and valve butterfly in open position, assemble actuator assembly to endbell and housing with actuator crank (Ref. Fig. 401) engaging slot in valve housing. Install screws but do not tighten.

(3) Cycling butterfly from full open to full closed position, move actuator assembly and endbell on loose screws to allow free and full movement of butterfly. Tighten screws to a torque of 16 to 20 pound-inches.

(4) Remove protective caps and connect electrical connector to actuator receptacle.

R (5) Remove tags and close circuit breakers opened in Steps
R 4A(2) and 4A(3).

(6) Turn on electrical power (Ref. 24-00-00).

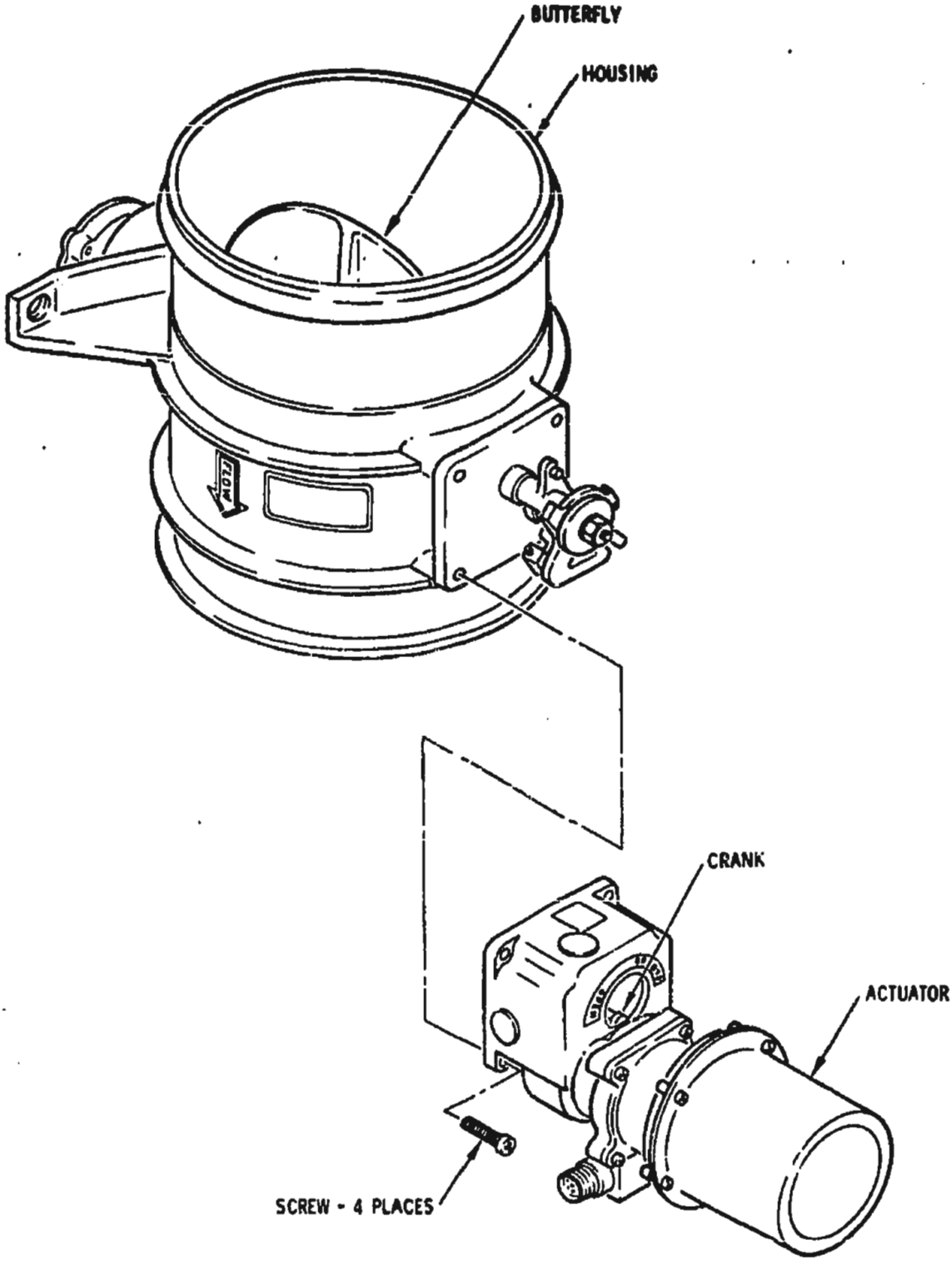
R (7) On FE/SO ECS MONITOR panel, AVIONIC AIR FWD LO FLO light must go off soon after FESC fan starts.

5. Operational Check

R (1) Verify AVIONIC AIR MID, LO FLO light on FE/SO ECS MONITOR panel is off.

(2) Place aircraft in simulated gear up (airborne) condition (Ref. 32-63-00).

R (3) On FE/SO ECS MONITOR panel, release COOL AIR OVBD switchlight to the close (out) position. MESC exhaust control valve must close and CLOSE light comes on.



M1-0100-21-390

MESC Exhuast Control Valve Actuator - Removal and Installation
Figure 401

AVIONIC AIR MID, OVBD light goes off and MID LO FLO light remains off.

(4) Depress COOL AIR OVBD switchlight to normal (latched in) position. Exhaust control valve must open and
R CLOSE light goes off. AVIONIC AIR MID OVBD light comes on and MID LO FLO light remains off.

(5) Remove aircraft from simulated gear up (airborne) condition (Ref. 32-63-00) and verify MID OVBD light remains on.

R (6) Close access door opened in Step 4A(4).

R (7) Remove tag installed in Step 4A(1).

(8) Turn off electrical power (Ref. 24-00-00).

FLIGHT STATION INSTRUMENT COOLING AIR FLOW SENSOR REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

Protective plugs (sensor duct opening)O-ring, MS9385-04 or equivalent

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On FE/SO ELECTRICAL panel, zone 215, select electrical power to GND SERVICE (Ref. 24-00-00).

(2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breakers:

INSTR - COOLING (A21)

AVIONIC - AIR - MON (L5)

(3) Remove FE/SO kickpanel below the instrument cooling inlet grille (Ref. Fig. 401).

R (4) Disconnect electrical cable connector from sensor (Ref.
R Fig. 401).

R (5) Install protective caps on electrical cable connector and sensor receptacle.

(6) Using wrench on wrench flats, remove sensor and O-ring from duct and discard O-ring.

R (7) Install protective plug in sensor duct opening if new sensor is not to be installed immediately.

B. Installation

(1) Verify circuit breakers opened in Step 3A(2) are open and tagged.

R (2) Remove protective plug from sensor duct opening if installed.

(3) Replace O-ring and install sensor into duct opening using wrench on wrench flats.

(4) Remove protective caps and connect electrical cable
R connector to sensor.

(5) Remove tag and close circuit breaker AVIONIC - AIR - MON (L5) opened in Step 3A(2).

(6) Verify PILOT INSTR COOL FAN light on FE/SO annunciator panel is on.

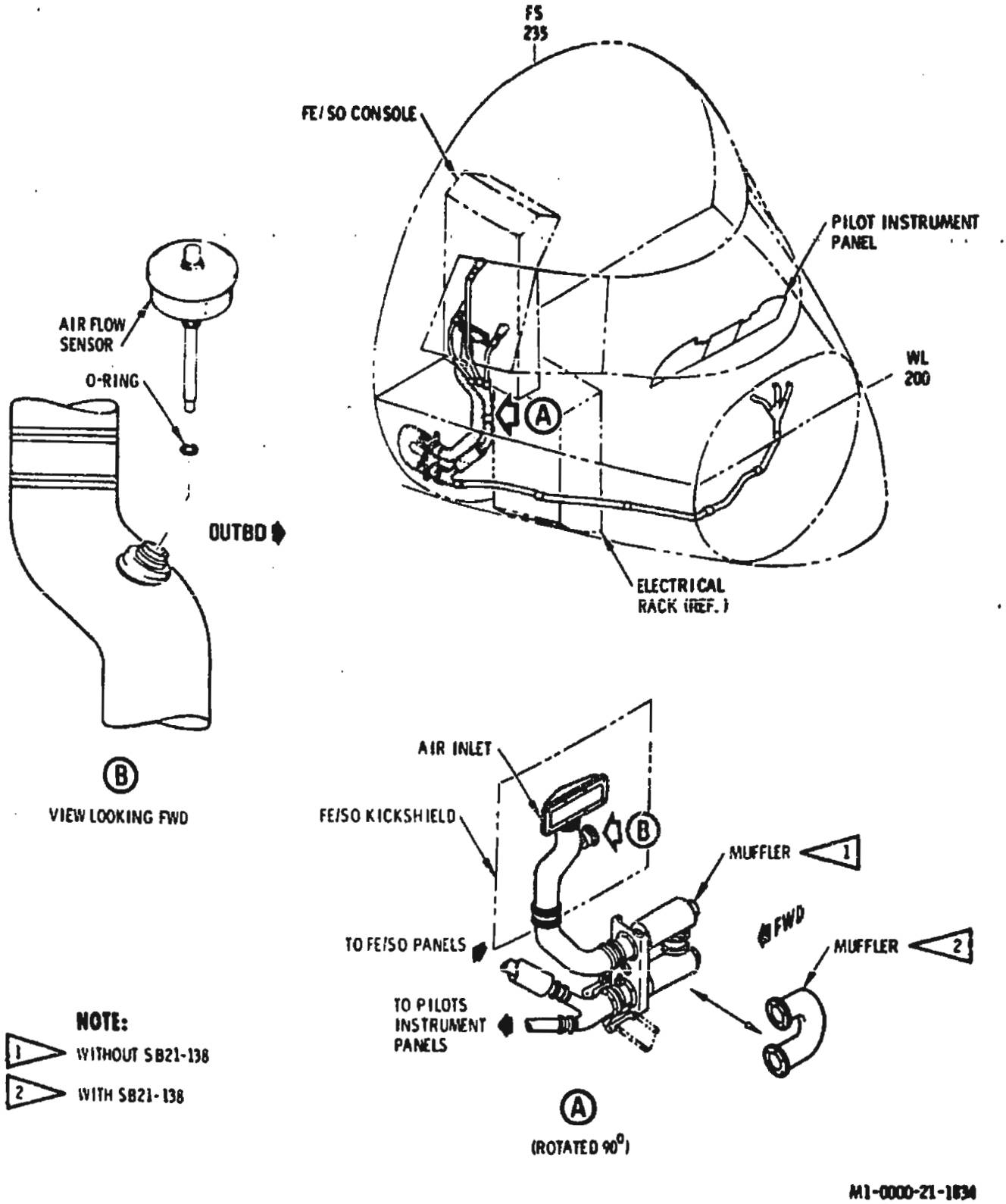
(7) Remove tag and close circuit breaker INSTR - COOLING (A21) opened in Step 3A(2).

(8) Turn on full service electrical power (Ref. 24-00-00).

(9) Verify flight station instrument cooling fan is running.

(10) Verify PILOT INSTR COOL FAN light on FE/SO annunciator panel goes off.

(11) Reinstall FE/SO kickpanel removed in Step 3A(3).



Flight Station Instrument Cooling Air Flow Sensor
Removal and Installation
Figure 401

FLIGHT STATION INSTRUMENT COOLING AIR FLOW SENSOR ADJUSTMENT AND TEST

1. General

The Flight Station Instrument Cooling Air Flow Sensor detects failure of the instrument cooling fan. If the fan fails, an internal switch in the flow sensor closes and illuminates the PILOT INSTR COOL FAN annunciator on the Flight Engineer/Second Officer (FE/SO) panel.

The sensor is a nonadjustable and nonrepairable item. If the sensor is suspected of malfunctioning, it should be replaced and sent to the shop for a complete test. The following procedure will provide a go/no-go indication of operation in the aircraft.

2. Referenced Procedures

21-25-32	Flight Station Instrument Cooling Air Flow Sensor - Removal and Installation
21-25-32	Flight Station Instrument Cooling Air Flow Sensor - Cleaning and Painting
24-00-00	Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) Turn on full service electrical power (Ref. 24-00-00).

(2) On FE/SO annunciator panel, verify that PILOT INSTR COOL FAN light is off.

(3) On FE/SO overhead circuit breaker panel CB2 zone 215, open circuit breaker INSTR COOLING (A21).

NOTE: PILOT INSTR COOL FAN light must come on within 40 seconds. If annunciator light is not on within 40 seconds, close circuit breaker, remove sensor and clean (Ref. 21-25-32). Reinstall sensor and repeat test. If operating time is still more than 40 seconds, replace sensor.

(4) As soon as annunciator light comes on, close circuit breaker INSTR COOLING (A21).

NOTE: PILOT INSTR COOL FAN light must go off within 40 seconds. If annunciator light is not off within 40 seconds, remove sensor and clean (Ref. 21-25-32). Reinstall sensor and repeat test. If operating time is still more than 40 seconds, replace sensor.

FLIGHT STATION INSTRUMENT COOLING AIR FLOW SENSOR CLEANING AND PAINTING

1. Equipment and Materials

Solvent, Fed Spec P-S-661, or equivalent

Soft bristle brush

2. Referenced Procedure

21-25-32 Flight Station Instrument Cooling Air Flow Sensor - Removal and Installation

3. Cleaning/Painting

A. Cleaning

(1) Using wrench on wrench flats, remove sensor from duct (Ref. 21-25-32).

WARNING: DO NOT USE COMPRESSED AIR IN EXCESS OF 10 PSIG. WEAR PROTECTIVE GOGGLES WHILE USING COMPRESSED AIR. FAILURE TO COMPLY MAY RESULT IN EYE INJURY.

CAUTION: THE SENSOR ELEMENT IS FRAGILE. USE CARE NOT TO DAMAGE ELEMENT WHILE CLEANING.

(2) Brush collected dirt out of element cage on end of sensor with soft-bristle brush, or blow sensor clean with compressed air at not more than 10 psi pressure.

WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

(3) Wipe sensor stem with a soft rag moistened with solvent.

(4) Using wrench on wrench flats, reinstall sensor in duct (Ref. 21-25-32).

B. Painting

NOTE: No painting procedure is provided.

BATTERY COOLING AIR CONTROL/DIVERTER VALVE ACTUATOR REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Protective caps (electrical connector)

R 2. Referenced Procedures

21-25-00 Battery Cooling System - Adjustment and Test

R 3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breaker BAT - CHG (A15).

(2) Remove galley ceiling access panels 135HL and 135JL.

R R (3) Remove electrical cable connector from actuator pigtail (Ref. Fig. 401).

R R (4) Install protective caps on electrical cable connector and actuator pigtail connector.

R (5) Remove two bolts securing actuator to duct assembly and remove actuator.

B. Installation

R (1) Verify circuit breaker opened in Step 3A(1) is open and tagged.

(2) Gain access through galley ceiling access panels 135HL and 135JL.

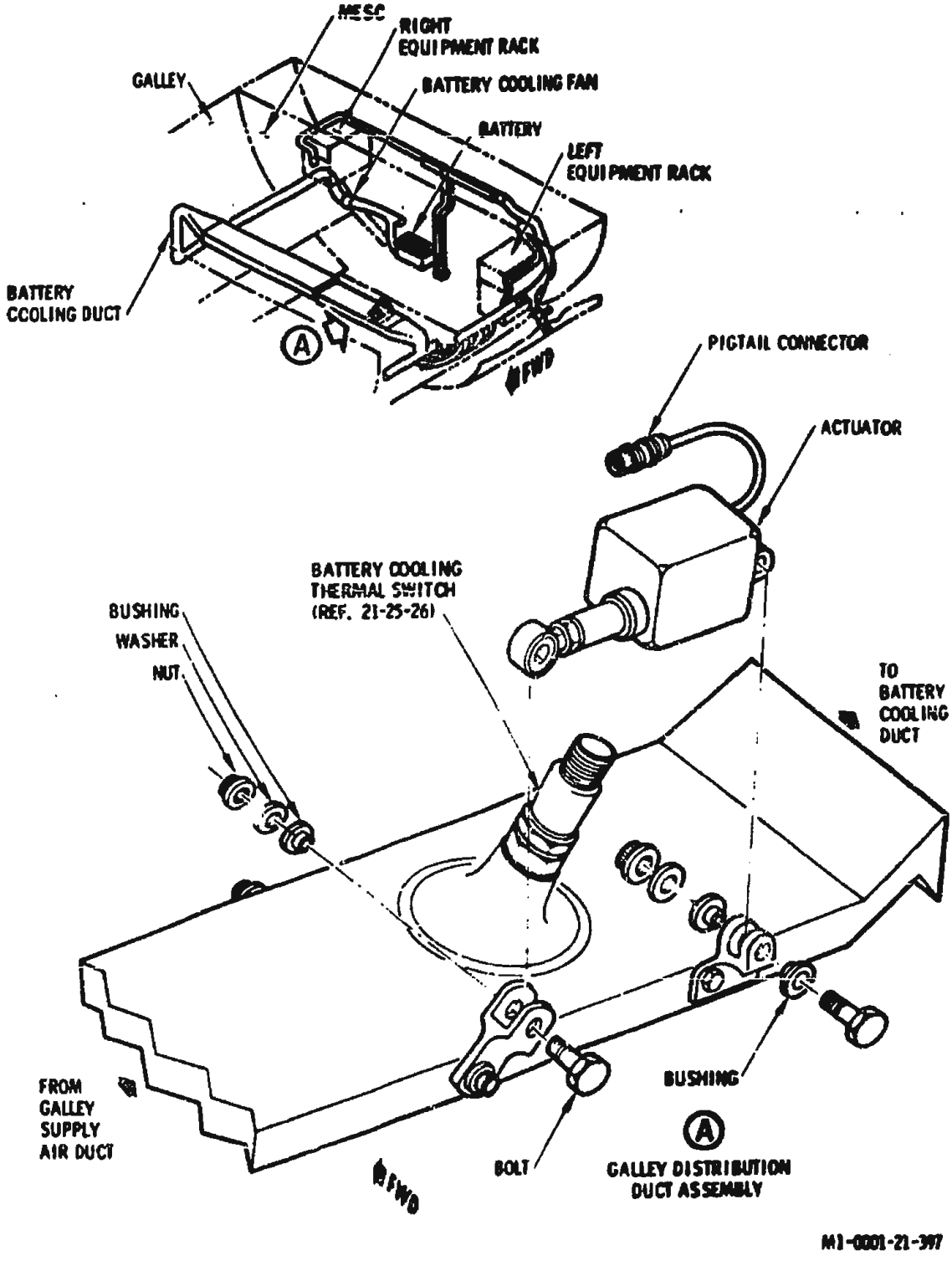
(3) Install actuator on galley distribution duct assembly and tighten nuts at each end.

(4) Remove protective caps and connect electrical cable connector to actuator pigtail connector.

R R (5) Remove tag and close circuit breaker opened in Step 3A(1).

(6) Verify proper operation of diverter valve actuator by performing Battery Cooling System Functional Test (Ref. 21-25-00).

R R (7) Install access panels 135HL and 135JL removed in Step 3A(2).



M1-0001-21-397

R Battery Cooling Air Control/Diverter Valve Actuator
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

INSTRUMENT COOLING DIVERTER VALVE ACTUATOR MAINTENANCE PRACTICES

1. General

The Instrument Cooling Diverter Valve Actuator is located on the instrument cooling duct in the aft right Forward Electronic Service Center (FESC) zone 112. During airborne operation the valve is closed. During cold weather ground operations when hot preconditioned ground air is applied, the valve is open. This allows the instrument cooling fan to cool the Flight Station instruments with air drawn from the FESC.

R R R NOTE: The diverter valve may be inoperative in either position if the instrument cooling fan is operative. If the fan is inoperative, the valve must be secured in the normal (cold air plenum source) position.

2. Equipment and Materials

Protective Caps (electrical connectors)

3. Maintenance Practices

R A. Deactivation (Fan operative)

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

(1) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, zone 215, open and collar circuit breaker INSTR - GND - COOL (J1).

(2) Locate actuator on aft right side of FESC and disconnect electrical cable connector from actuator pigtail connector (Ref. Fig. 201).

(3) Install protective caps on both connectors and stow for flight.

(4) Placard FE/SO panel INSTRUMENT COOLING - DIVERTER VALVE INOP.

(5) Make appropriate entry in aircraft log book.

R R B. Deactivation (CLOSED, COLD AIR PLENUM SOURCE, Fan inoperative)

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

(1) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, zone 215, open and collar circuit breaker INSTR - GND - COOL (J1).

(2) Locate actuator on aft right side of FESC and disconnect electrical cable connector from actuator pigtail connector (Ref. Fig. 201).

(3) Install protective caps on both connectors and stow for flight.

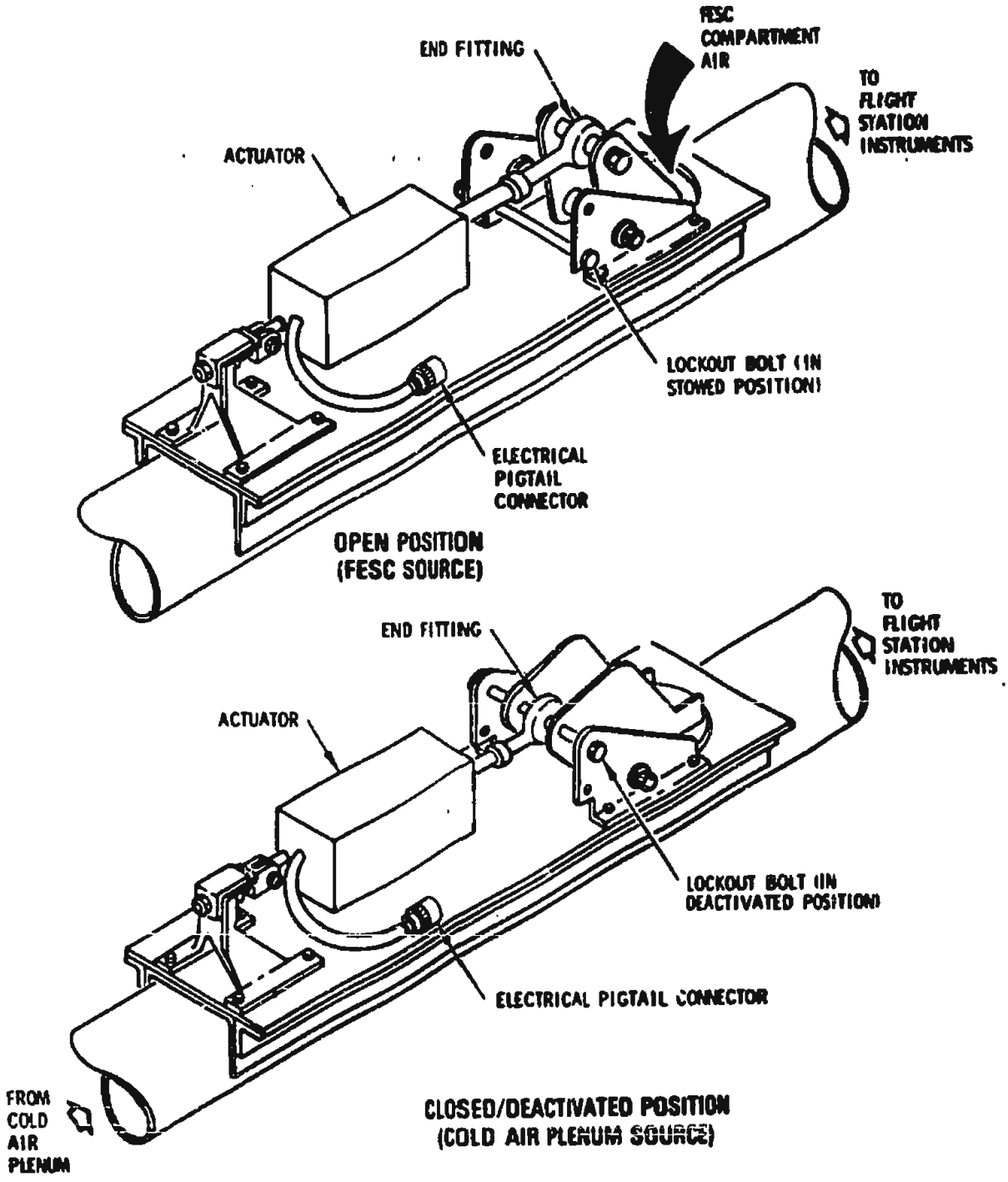
(4) Disconnect actuator end fitting from diverter valve linkage by removing bolt. Retain bolt for future use.

(5) Remove lockout bolt from stowed position.

(6) Close diverter valve manually, lock with lockout bolt and secure actuator end fitting on lockout bolt.

(7) Placard FE/SO panel INSTRUMENT COOLING DIVERTER VALVE INOP.

(8) Make appropriate entry in aircraft log book.



MI-0001-21-765

R Instrument Cooling Diverter Valve Actuator
R Deactivation
R Figure 201

R EFFECTIVITY: 032-999
R
0018

INSTRUMENT COOLING DIVERTER VALVE ACTUATOR REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

2. Referenced Procedure

21-25-34	Instrument Cooling Diverter Valve Actuator - Maintenance Practices
24-00-00	Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breakers:

INSTR - GND - COOL (J1)

AVIONICS - AIR - MON (L5)

(2) Disconnect electrical cable connector from actuator pigtail connector (Ref. Fig. 401).

(3) Install protective caps on both connectors.

(4) Remove two bolts securing actuator to diverter valve assembly (Ref. Fig. 401) and remove actuator. Retain bolts, nuts and washers for reinstallation of actuator.

(5) Place diverter valve in closed/deactivated position (Ref. 21-25-34 Maintenance Practices) if actuator is not to be replaced immediately.

B. Installation

(1) Verify circuit breakers opened in Step 3A(1) are open and tagged.

(2) Remove lockout bolt from deactivated position, if installed, and reinstall in stowed position.

(3) Install actuator on diverter valve assembly and tighten bolts at each end.

(4) Remove protective caps and connect electrical cable
R connector to actuator pigtail connector.

(5) Locate instrument cooling high temperature switch, forward of instrument cooling fan, remove connector from switch and jumper pin B to pin C.

(6) Remove tags and close circuit breakers opened in Step 3A(1).

(7) Turn on full service electrical power (Ref. 24-00-00).

(8) Verify actuator extends to open valve flapper (FESC source position).

(9) On FE/SO annunciator panel, verify PILOT INSTR COOL SYS light is on.

(10) Move jumper on temperature switch connector to pins A and B.

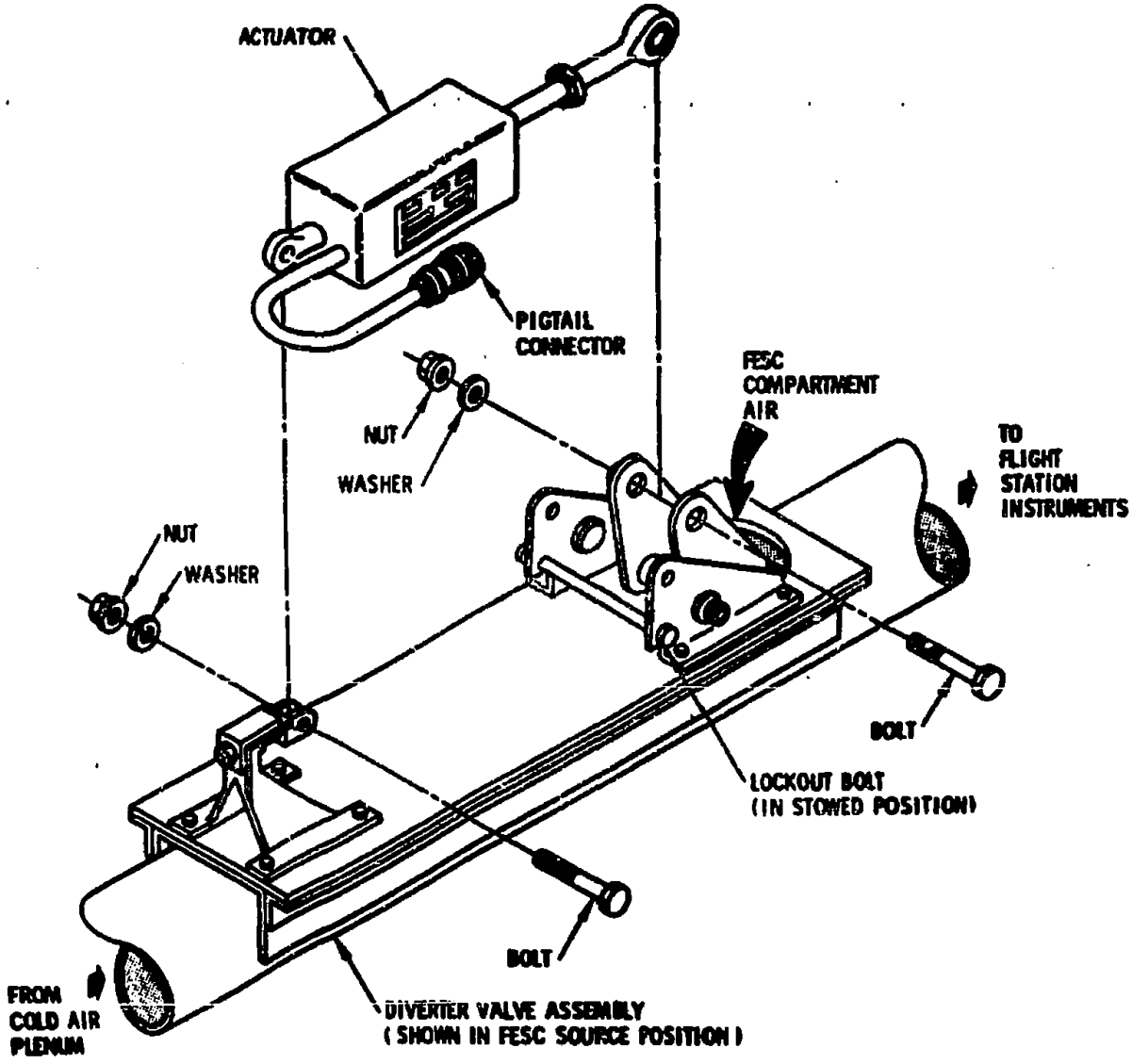
(11) Verify actuator retracts to close flapper (cold air plenum source position).

(12) Verify PILOT INSTR COOL SYS light goes off.

(13) Open circuit breaker INSTR - GND - COOL (J1) on CB2 panel.

(14) Remove jumper and reconnect electrical connector to temperature switch.

(15) Close circuit breaker INSTR - GND - COOL (J1).



M1-0002-21-727

R Instrument Cooling Diverter Valve Actuator
R Removal and Installation
R Figure 401

R INSTRUMENT COOLING FAN DIFFERENTIAL PRESSURE SWITCH
R MAINTENANCE PRACTICES

R 1. General

R The Instrument Cooling Fan Differential Pressure Switch senses
R failure of the instrument cooling fan and turns on the PILOT
R INSTR COOL SYS light on the Flight Engineer/Second Officer
R (FE/SO) annunicator panel.

R The pressure switch is located in the instrument cooling duct on
R the aft right side of the Forward Electronic Service Center
R (FESC), zone 112.

R 2. Equipment and Materials

R Protective Caps

R 3. Referenced Procedures

R 24-00-00 Electrical Power - Maintenance Practices

R 32-63-00 Air/Ground Sensing System - Maintenance Practices

R 4. Maintenance Practices

R A. Deactivation

R NOTE: This deactivation procedure applies only when an
R aircraft is to be dispatched in accordance with the
R MEL.

R (1) On Flight Engineer/Second Officers (FE/SO) overhead
R circuit breaker panel, CB2, zone 215, open and tag
R circuit breaker AVIONICS - AIR - MON (L5).

R (2) Open access door 112AB.

R (3) In right section of forward electronic service center,
R zone 112, remove electrical cable connector from
R instrument cooling system differential pressure switch
R receptacle.

R (4) Install protective cap on electrical cable connector
R and stow for flight.

R (5) Install protective cap on switch receptacle.

R (6) Remove tag and close circuit breaker opened in Step
R 3A(1).

R (7) Verify PILOT INSTR COOL SYS light is operative:

R (a) Turn on electrical power (Ref. 24-00-00).

R (b) On FE/SO annunciator panel verify PILOTS INSTR
R COOL SYS light is out. If light is out proceed to
R Step (c). If light is on proceed to Step (k).

R (c) In FESC, just forward of aft bulkhead, locate duct
R temperature switch on bottom side of large square
R duct near aircraft center line.

R (d) Disconnect electrical plug from switch.

R (e) Jumper pin B to C of cable plug.

R (f) Verify PILOT INSTR COOL SYS light on FE/SO
R annunciator panel comes on.

R (g) Move jumper from pin C to pin A.

R (h) When PILOT INSTR COOL SYS light goes out remove
R jumper wire from plug.

R (i) Connect electrical plug to switch.

R (j) Proceed to Step (8).

R (k) Set air/ground sensing system in simulated
R airborne condition (Ref. 32-63-00).

R (l) Verify PILOT INSTR COOL SYS light goes out.

R (m) Return aircraft to ground condition (Ref.
R 32-63-00).

R (8) Turn off electrical power (Ref. 24-00-00).

R (9) On FE/SO annunciator panel, zone 215, placard PILOT
R INSTR COOL SYS indicator light. INSTRUMENT COOLING
R SYSTEM DIFFERENTIAL PRESSURE SWITCH INOPERATIVE.

R (10) Make appropriate entry in aircraft log book.

R R INSTRUMENT COOLING FAN DIFFERENTIAL PRESSURE SWITCH REMOVAL AND INSTALLATION

R 1. Equipment and Materials

R Protective caps (electrical connector and threaded fittings)

R Protective plugs (threaded duct opening)

R O-rings (1), MS9068-012 or equivalent

R O-ring (2), MS9068-014 or equivalent

R 2. Referenced Procedure

R 24-00-00 Electrical Power - Maintenance Practices

R 3. Removal/Installation

R A. Removal

R (1) On Flight Engineer/Second Officer (FE/SO) ELECTRICAL panel, select GND SERVICE bus for electrical power (Ref. 24-00-00).

R (2) On pilots overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker AVIONICS - AIR - MON (L5).

R (3) Disconnect electrical cable connector from switch.

R (4) Install protective caps on electrical cable connector and switch receptacle.

R (5) Disconnect downstream sensing tube from elbow in top of switch.

R (6) Loosen jam nut, remove elbow from switch and discard O-ring.

R (7) Remove switch and union from duct.

R (8) Remove union from switch and discard both O-rings.

R (9) Install protective cap on elbow and a plug in the threaded duct opening.

R B. Installation

R (1) Verify circuit breaker opened in Step 3A(1) is open and
R tagged.

R (2) Remove protective cap from elbow and remove plug from
R threaded duct opening.

R (3) Install new upper and lower O-rings on union and
R install union in switch (Ref. Fig. 401).

R (4) Install union and switch into duct.

R (5) Run jam nut fully on long leg of elbow and install new
R O-ring in groove of long leg between threaded areas.

R (6) Install long leg of elbow into switch until O-ring
R touches shoulder of switch fitting, then tighten jam
R nut on O-ring.

R (7) Connect downstream sensing tube to elbow in top of
R switch.

R (8) Remove protective caps and connect electrical cable
R connector to switch receptacle.

R (9) Remove tag and close circuit breaker AVIONICS - AIR -
R MON (L5).

R (10) Turn on full service electrical power (Ref. 24-00-00).

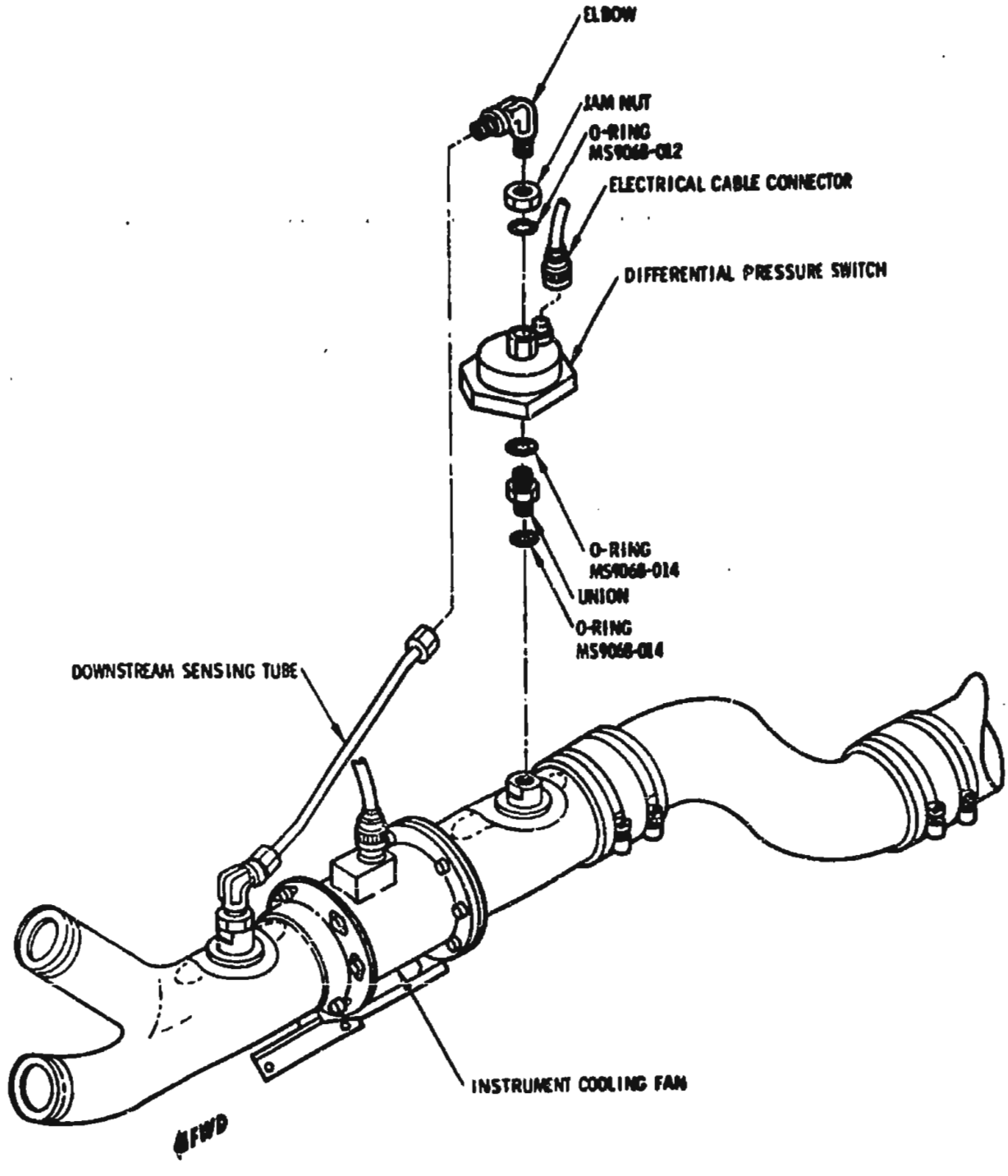
R (11) Verify PILOT INSTR COOL SYS light on FE/SO annunciator
R panel is off.

R CAUTION: TO PREVENT OVERHEATING OF FLIGHT STATION
R INSTRUMENTS, DO NOT ALLOW INSTRUMENT COOLING FAN
R TO BE INOPERATIVE ANY LONGER THAN 2 MINUTES.

R (12) On FE/SO overhead circuit breaker panel CB2, open
R circuit breaker INSTR - COOLING (A21).

R (13) Verify PILOT INSTR COOL SYS light comes on.

R (14) Close circuit breaker INSTR - COOLING (A21).



R Instrument Cooling Fan Differential Pressure Switch
R Removal and Installation
R Figure 401

R EFFECTIVITY: 032-999
R
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INSTRUMENT COOLING FAN DIFFERENTIAL PRESSURE SWITCH ADJUSTMENT AND TEST

1. General

The Instrument Cooling Fan Differential Pressure Switch senses failure of the instrument cooling fan and turns on the PILOT INSTR COOL SYS light on the Flight Engineer/Second Officer (FE/SO) annunciator panel. The switch cannot be adjusted in the aircraft. The following procedure will verify acceptable switch operation in the aircraft. If switch operation is not as detailed, replace switch. The switch is located on the instrument cooling duct, aft of the instrument cooling fan in the Forward Electronic Service Center (FESC), zone 110.

2. Equipment and Materials (Functional Test)

Pitot/Static field tester Type MB-1, Pitot/Static tester, Burton 2024B, Pitot/Static tester, Millhard Engineering Co. P/N 127, or equivalent

3. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

4. Adjustment/Test

A. Operational Test

(1) On the FE/SO overhead circuit breaker panel CB2, zone 215, verify the following circuit breakers are closed:

INSTR - GND - COOL (J1)

AVIONICS - AIR - MON (L5)

INSTR - COOLING (A21)

(2) Turn on full service electrical power (Ref. 24-00-00).

(3) Verify PILOT INSTR COOL SYS light on FE/SO annunciator panel is off.

NOTE: If high temperature ground air carts are in use, the PILOT INSTR COOL SYS light may already be on. If so, remove high temperature ground air

R long enough for cold air plenum to cool off.
R When cool, the light will go off.

R CAUTION: DO NOT ALLOW INSTRUMENT COOLING FAN TO BE
R INOPERATIVE ANY LONGER THAN 2 MINUTES.

R (4) On FE/SO overhead circuit breaker panel CB2, open
R circuit breaker INSTR - COOLING (A21).

R (5) Verify PILOT INSTR COOL SYS light comes on then close
R circuit breaker (A21).

R B. Functional Test

R (1) On FE/SO ELECTRICAL panel, select GND SERVICE for
R electrical power (Ref. 24-00-00).

R (2) Verify PILOT INSTR COOL SYS light on FE/SO annunciator
R panel is on.

R (3) On right side of FESC at FS235, locate differential
R pressure switch on instrument cooling duct, aft of
R instrument cooling fan.

R (4) Disconnect sense tube from elbow in top of differential
R pressure switch.

R (5) Adjust tester to use airspeed indicator (knots) as
R differential pressure indicator and connect pressure
R port of tester to elbow in top of differential pressure
R switch (Ref. Fig. 501).

R CAUTION: DO NOT EXCEED 115 KNOTS INDICATED AIRSPEED (8.5
R INCHES OF WATER) WHEN PERFORMING STEP (6).

R (6) Slowly increase tester indicated airspeed. Verify
R PILOT INST COOL SYS light goes out, with indicated
R airspeed of 36 to 42 knots.

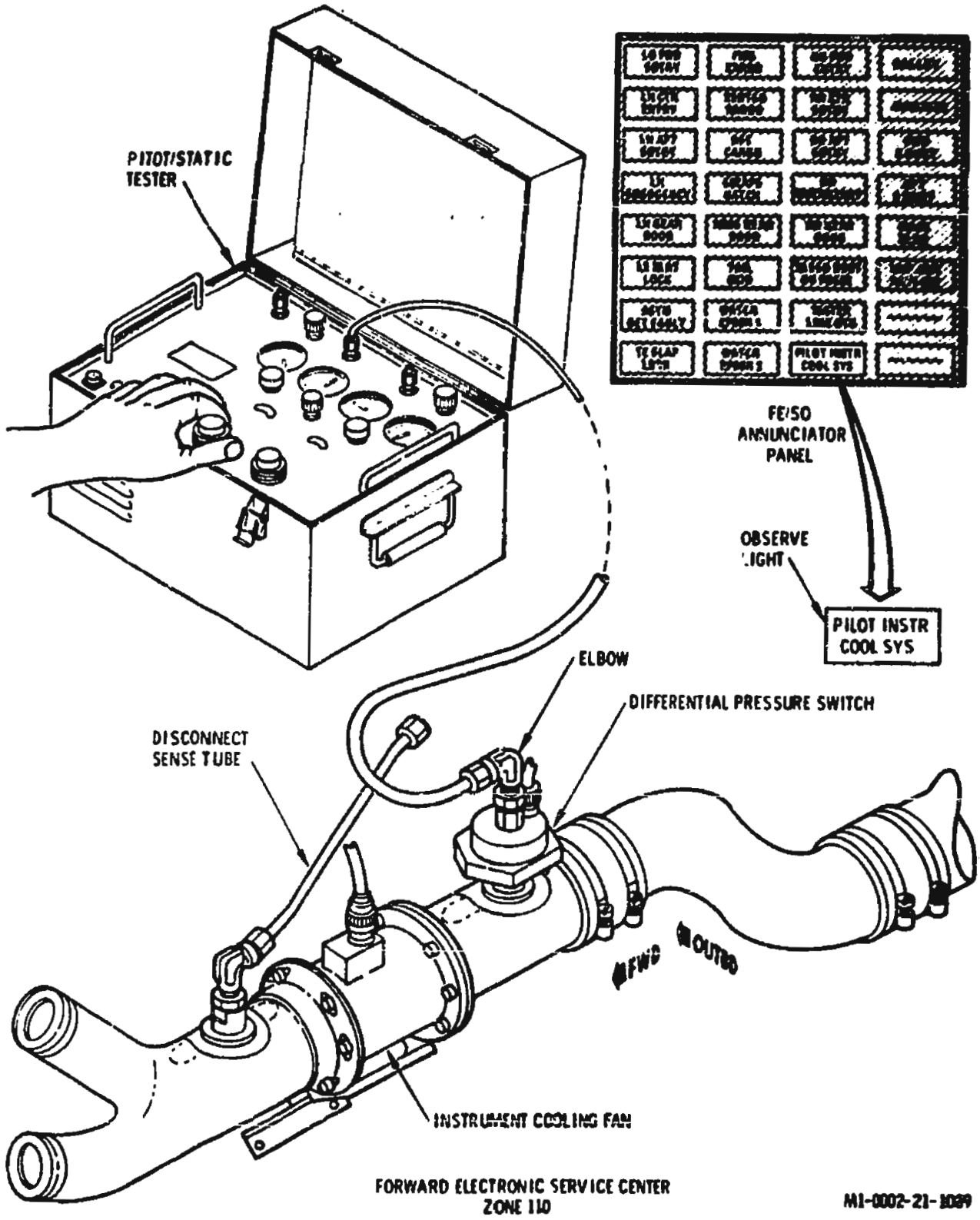
R (7) Slowly decrease indicated airspeed. Verify PILOT INST
R COOL SYS light comes on, when indicated airspeed has
R decreased approximately 8 knots, to 28 to 35 knots (0.5
R to 0.8 inches of water).

R (8) Reduce indicated airspeed to zero and disconnect
R tester.

R (9) Reconnect sense tube to elbow in top of switch.

R (10) Turn on full service electrical power (Ref. 24-00-00).

R (11) Perform operational test (Ref. Paragraph 4A).



R Instrument Cooling Differential Pressure Switch
R Functional Test
R Figure 501

R EFFECTIVITY: 032-999

INSTRUMENT GROUND COOLING TEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connectors)

Protective Plug (switch duct opening)

2. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

36-00-00 Pneumatic System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) ELECTRICAL panel, select GROUND SERVICE bus for electrical power (Ref. 24-00-00).

(2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker INSTR - GND - COOL (J1).

(3) Disconnect electrical cable connector from switch (Ref. Fig. 401).

(4) Cap electrical cable connector and switch receptacle.

(5) Remove switch from duct.

(6) Install protective plug in threaded duct opening if new switch is not being installed immediately.

B. Installation

(1) Verify circuit breaker INSTR - GND - COOL (J1) on CB2 panel is open and tagged.

(2) Remove protective plug from threaded duct opening if installed.

R R (3) Install temperature switch into duct opening (Ref. Fig. 401).

(4) Remove protective caps and connect electrical cable
R connector to switch.

C. Operational Test

(1) Locate instrument cooling air high temperature switch in duct just forward of instrument cooling fan (Ref. Fig. 401) and disconnect electrical connector. Jumper pins A and B.

(2) Remove tag and close circuit breaker INSTR - GND - COOL (J1) on CB2 panel.

(3) On FE/SO ELECTRICAL panel, select full service electrical power (Ref. 24-00-00).

(4) Verify PILOT INSTR COOL SYS light on FE/SO annunciator panel is off.

NOTE: If high temperature ground air carts are in use the PILOT INSTR COOL SYS light will be on. If so, remove high temperature air long enough for the cold air plenum to cool off. When cool the light should be off. No further testing is required.

(5) Connect high temperature ground air (Ref. 36-00-00).

(6) On FE/SO CABIN TEMP CONTROL panel, depress three PACK FLOW CONTROL switchlights and verify flowbars are on.

WARNING: TO PROTECT THE FLIGHT STATION INSTRUMENTS, PACK OPERATION IN MANUAL HOT MUST BE LIMITED TO TWO MINUTES OR LESS.

(7) Release three AUTO/MNL switchlights and verify MNL light is on.

(8) Press three WARM switches and verify TURB BYP and RAM AIR indicators go fully clockwise to hottest position. Limit operation in this mode to two minutes or less.

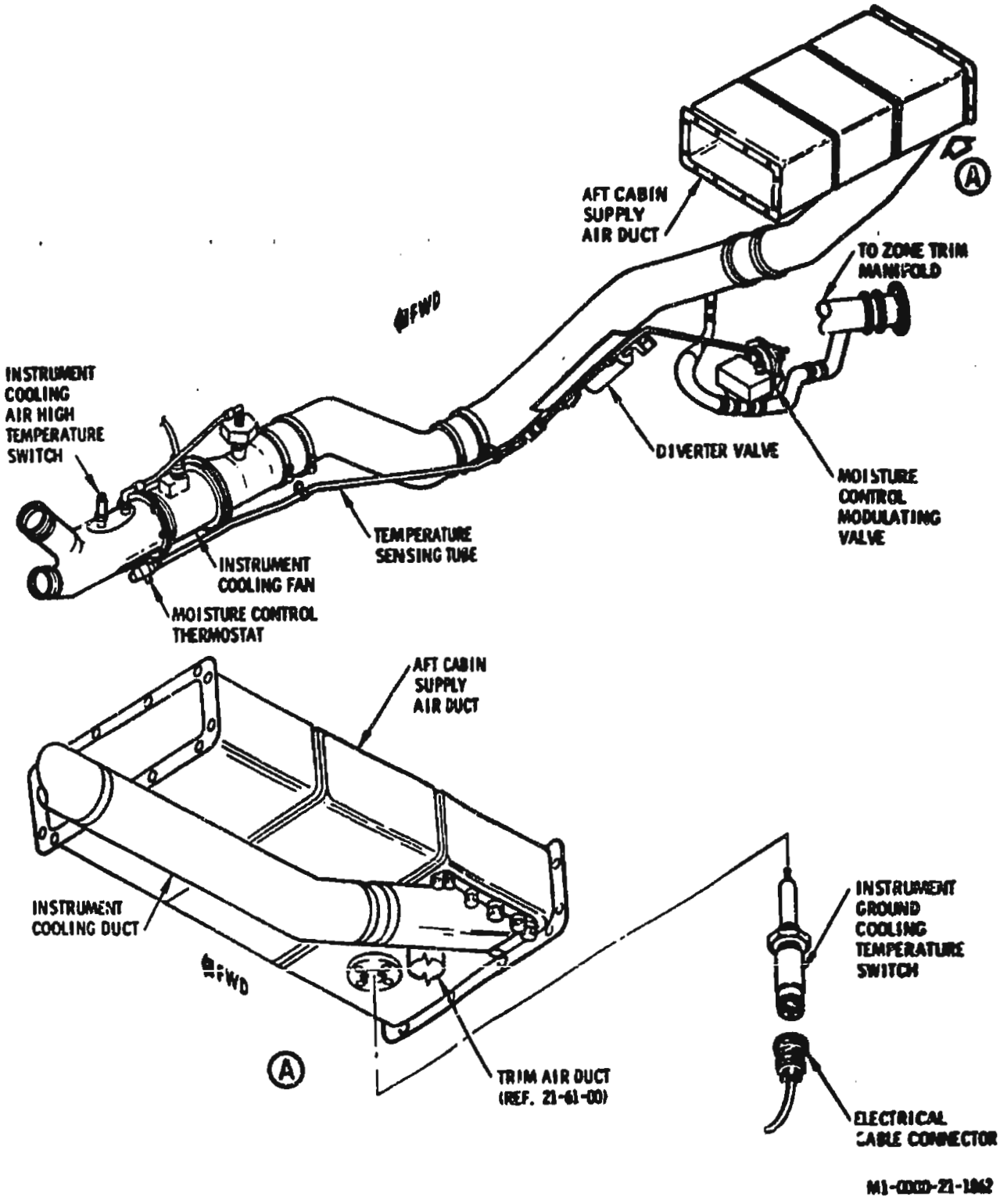
(9) Verify PILOT INSTR COOL SYS light comes on in approximately one minute.

(10) Depress three AUTO/MNL switchlights and verify AUTO light comes on.

(11) Verify PILOT INSTR COOL SYS light goes off in approximately one minute.

(12) Turn off and disconnect high temperature ground air (Ref. 36-00-00).

(13) Open circuit breaker INSTR - GND - COOL (J1), remove jumper from pins A and B and reconnect electrical cable connector to instrument cooling air high temperature switch. Close circuit breaker.



R Instrument Ground Cooling Temperature Switch
R Removal and Installation
R Figure 401

R EFFECTIVITY: 032-999

INSTRUMENT COOLING MOISTURE CONTROL THERMOSTAT REMOVAL AND INSTALLATION

1. Equipment and Materials

O-ring, MS9068-014 or equivalent

2. Referenced Procedures

21-25-39 Instrument Cooling Moisture Control Thermostat - Adjustment and Test

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) ELECTRICAL panel, select GND SERVICE for aircraft electrical power (Ref. 24-41-00).

(2) If pneumatic system is operating, release both HOT AIR - ISLN VALVE switchlights on FE/SO CABIN TEMP CONTROL panel and verify flowbars are off.

WARNING: THERMOSTAT AND TEMPERATURE SENSING TUBE MAY BE HOT IF PNEUMATIC SYSTEM WAS OPERATING RECENTLY. WEAR PROTECTIVE GLOVES WHEN HANDLING HOT COMPONENTS.

(3) Disconnect temperature sensing tube from union in thermostat inlet port (Ref. Fig. 401).

(4) Remove four screws and remove thermostat from duct.

(5) Remove union from thermostat inlet port and discard O-ring.

B. Installation

(1) Replace O-ring and install union in thermostat inlet port.

(2) Install thermostat on cooling duct.

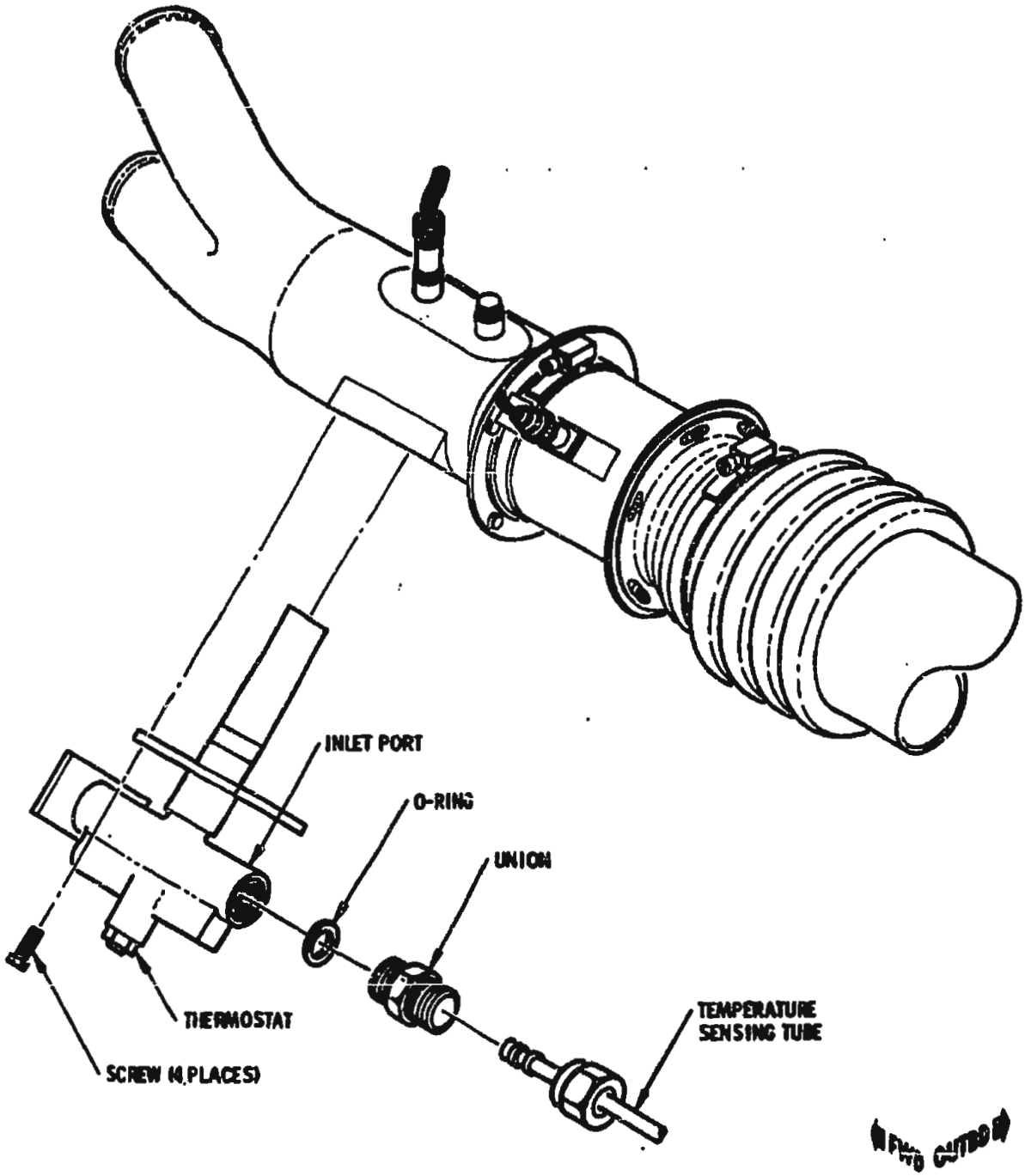
(3) Install and tighten four screws.

(4) Connect temperature sensing tube to union in thermostat inlet port.

(5) Verify all connections are secure.

(6) Depress both HOT AIR - ISLN VALVE switchlights to normal (latched in) position.

(7) Perform operational test(Ref. 21-25-39).



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Instrument Cooling Moisture Control Thermostat
Removal and Installation
Figure 401

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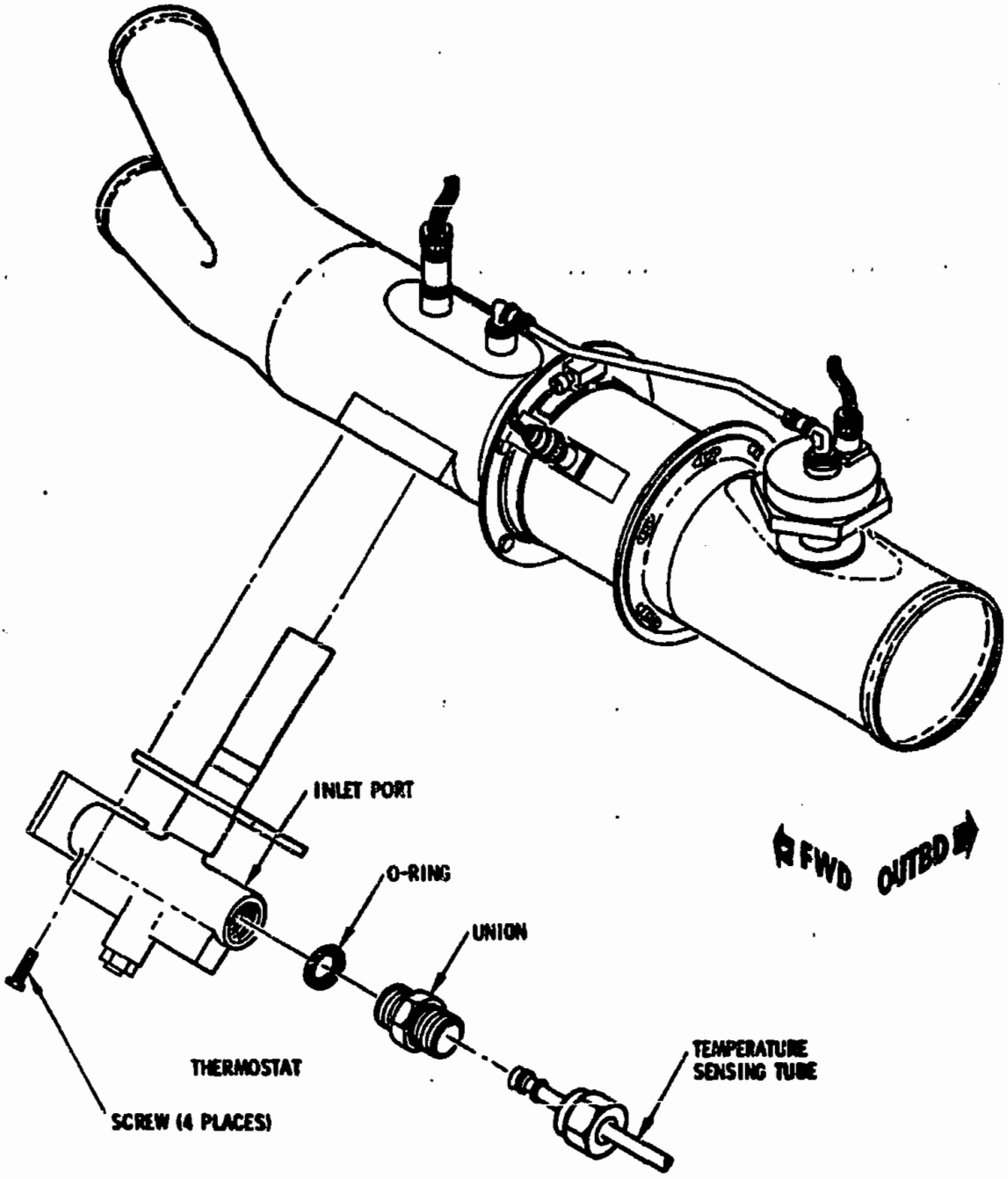

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R Instrument Cooling Moisture Control Thermostat
R Removal and Installation
R Figure 401

INSTRUMENT COOLING MOISTURE CONTROL THERMOSTAT ADJUSTMENT AND TEST

1. General

The Instrument Cooling Moisture Control Thermostat regulates a modulating valve which controls the amount of hot air introduced into the instrument cooling system. The thermostat maintains temperatures above 65°F (18°C) and below 75°F (24°C). This temperature range prevents moisture condensation on the flight station instruments.

The thermostat can not be adjusted in the aircraft. The following procedure will verify acceptable operation. If found to be defective, the thermostat must be replaced.

2. Equipment and Materials

Hot air gun

Freon

3. Referenced Procedures

	21-25-39	Instrument Cooling Moisture Control Thermostat - Removal and Installation
R	24-00-00	Electrical Power - Maintenance Practices
	36-00-00	Pneumatic System - Maintenance Practices

4. Adjustment/Test

A. Operational Test

R (1) Turn on full service electrical power (Ref. 24-00-00).

(2) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, verify the following circuit breakers are closed:

INSTR - COOLING (A21)

INSTR - GND - COOL (J1)

AVIONICS - AIR - MON (L5)

(3) Establish pneumatic source (Ref. 36-00-00).

(4) Verify both HOT AIR - ISLN VALVE switchlights on FE/SO CABIN TEMP CONTROL panel are depressed and flowbars are on.

CAUTION: MODULATING VALVE AND ASSOCIATED COMPONENTS MAY BE EXTREMELY HOT WITH PNEUMATIC SYSTEM OPERATING. WEAR PROTECTIVE GLOVES WHEN HANDLING HOT COMPONENTS.

(5) Verify there are no air leaks in instrument cooling ducts or component couplings.

NOTE: Particular attention should be directed to temperature sensing tube leading from instrument cooling moisture control thermostat to modulating valve (Ref. Fig. 501).

(6) Verify instrument cooling fan is operating normally.

(7) Verify instrument cooling moisture control modulating valve is operating normally as follows:

(a) Locate test button on instrument cooling moisture control thermostat (Ref. Fig. 501).

(b) Depress button to bottom and verify valve is open.

NOTE: There is a position indicator on valve, outboard of temperature sensing tube connection.

CR (c) Release button and verify valve is closed.

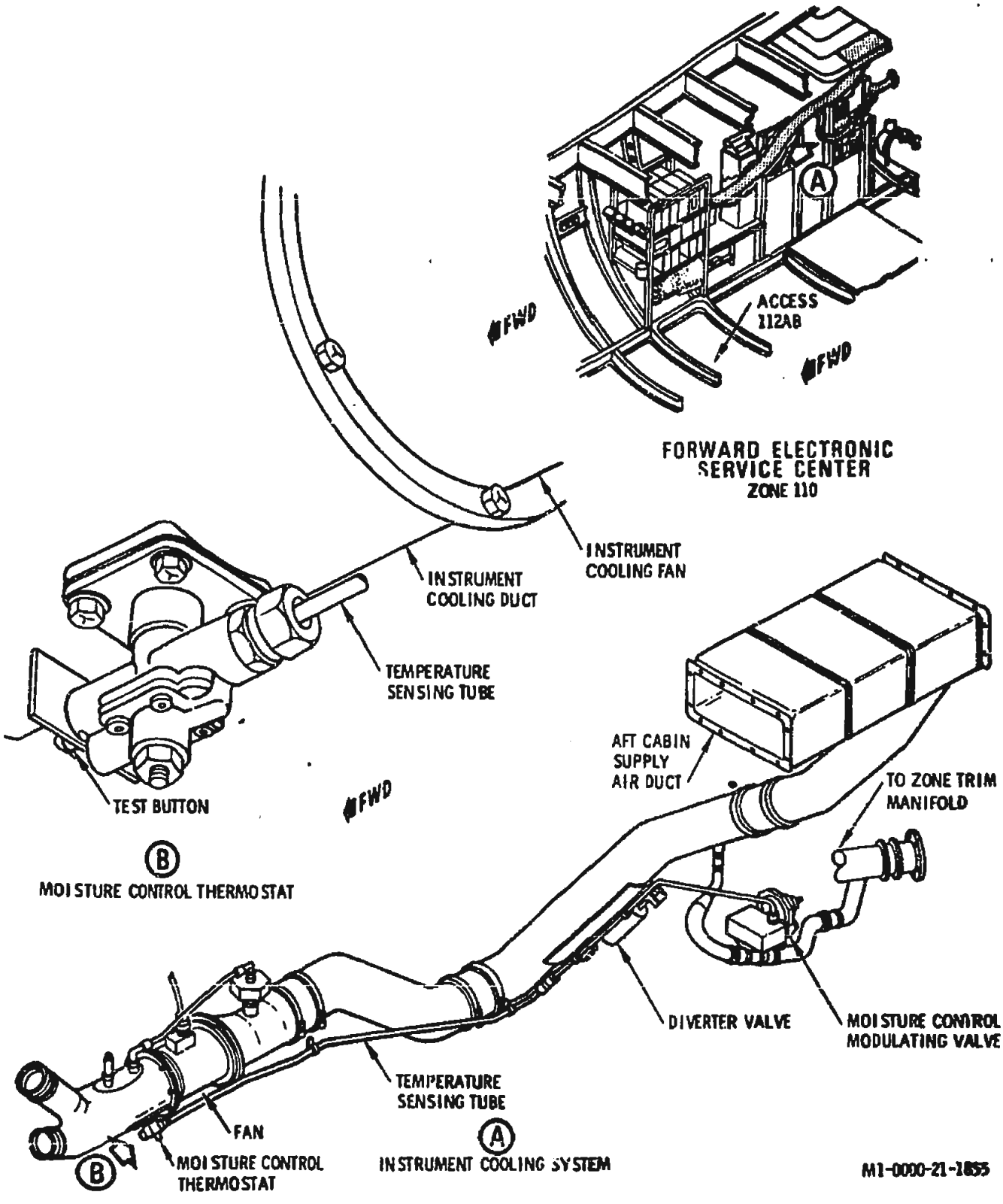
(8) Verify instrument cooling diverter valve is closed so that no air is entering valve from FESC.

CR (9) Remove moisture control thermostat from duct as
CR necessary to perform step 4A(10) or (11).

CR (10) If the moisture control modulating valve is open, warm
CR the instrument cooling moisture control thermostat with
CR hot air gun to above 75 F (24 C) and verify that
CR modulating valve closes.

CR (11) If the moisture control modulating valve is closed,
CR apply Freon to thermostat and verify modulating valve
CR opens.

(12) If modulating valve does not respond to these tests, replace thermostat (Ref. 21-25-39).



Instrument Cooling Moisture Control Thermostat
Adjustment and Test
Figure 501

R INSTRUMENT COOLING MOISTURE CONTROL MODULATING VALVE - MAINTENANCE PRACTICES

R 1. General

R The instrument cooling moisture control modulating valve may be inoperative provided the instrument cooling diverter valve is operational or, if inoperative, deactivated and locked in the open position.

R NOTE: The following procedures apply only when an aircraft is to be dispatched in accordance with the MEL.

R 2. Equipment and Materials

R Hold open device - Manufactured locally (Ref. Fig. 204)

R Protective Caps

R Electrical jumper

R Packaging Material

R 3. Verification/Deactivation

R A. Verify Instrument Cooling Diverter Valve is Operational

R (1) Turn on electrical power (Ref. 24-00-00).

R (2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (3) Gain access to FESC.

R (4) Locate instrument cooling high temperature switch located forward of instrument cooling fan.

R (5) Remove connector and place jumper between pins B and C.

R (6) On FE/SO overhead circuit breaker panel CB2, remove tags and close circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (7) Observe and verify instrument cooling diverter valve
R actuator extend to open valve flapper (FESC source
R position).

R (8) On FE/SO annunciator panel, verify PILOT INSTR COOL SYS
R light is on.

R (9) On FE/SO overhead circuit breaker panel CB2, open and
R tag circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (10) Reposition jumper on temperature switch connector
R between pins A and B.

R (11) On FE/SO overhead circuit breaker panel CB2, remove
R tags and close circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (12) Observe and verify instrument cooling diverter valve
R actuator retracts to close flapper (cold air plenum
R source position).

R (13) On FE/SO annunciator panel, verify PILOT INSTR COOL SYS
R light goes off.

R (14) On FE/SO overhead circuit breaker panel CB2, open and
R tag circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (15) Remove jumper and reconnect electrical connector to
R temperature switch.

R (16) On FE/SO overhead circuit breaker panel CB2, remove
R tags and close circuit breakers:

R INSTR-GND-COOL (J1)

R AVIONICS-AIR-MON (L5)

R (17) Turn off electrical power (Ref. 24-00-00).

R (18) Placard FE/SO annunciator panel INSTRUMENT COOLING
R MOISTURE CONTROL MODULATING VALVE INOP.

R (19) Make appropriate entry in aircraft log book.

R B. Deactivation of Instrument Cooling Valve in Open Position
R (FESC Source)

R NOTE: This procedure applies only if instrument cooling
R diverter valve is found to be inoperative.

R (1) On FE/SO overhead circuit breaker panel CB2, open and
R collar circuit breaker INSTR-GND-COOL (J1).

R (2) Disconnect elegtrical cable connector from actuator
R pigtail connector (Ref. Fig. 202).

R (3) Install protective caps on both connectors.

R (4) Remove two bolts securing actuator to diverter valve
R assembly and remove actuator (Ref. Fig. 202).

R (5) Tag, package, and stow diverter valve actuator and
R attaching parts in secure area.

R (6) Remove lockout bolt and retain for reuse (Ref. Fig.
R 203).

R (7) Remove clips and stow with actuator. Retain mounting
R screws for reuse.

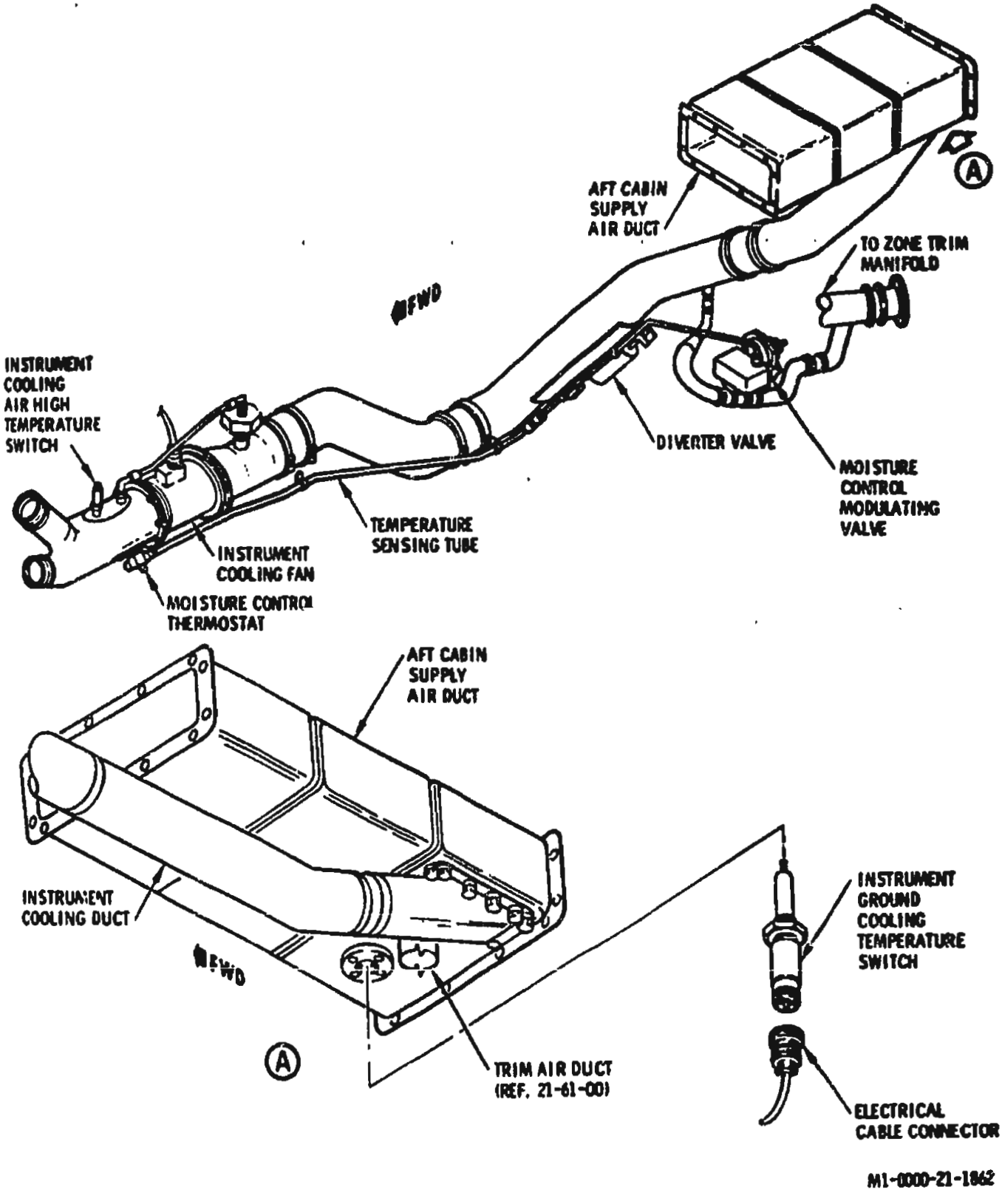
R (8) Install hold open device with clip mounting screws
R (Ref. Fig. 203).

R (9) Open and lock flapper valve in FESC source position
R with lockout bolt (Ref. Fig. 203).

R (10) Placard FE/SO annunciator panel INSTRUMENT COOLING
R DIVERTER VALVE INOP. LOCKED IN OPEN (FESC SOURCE)
R POSITION.

R NOTE: This placard to be placed directly below placard
R installed in Step 3A(18).

R (11) Make appropriate entry in aircraft log book.



R Instrument Cooling Temperature Switches
R Location and Access
R Figure 201

R EFFECTIVITY: 032-999

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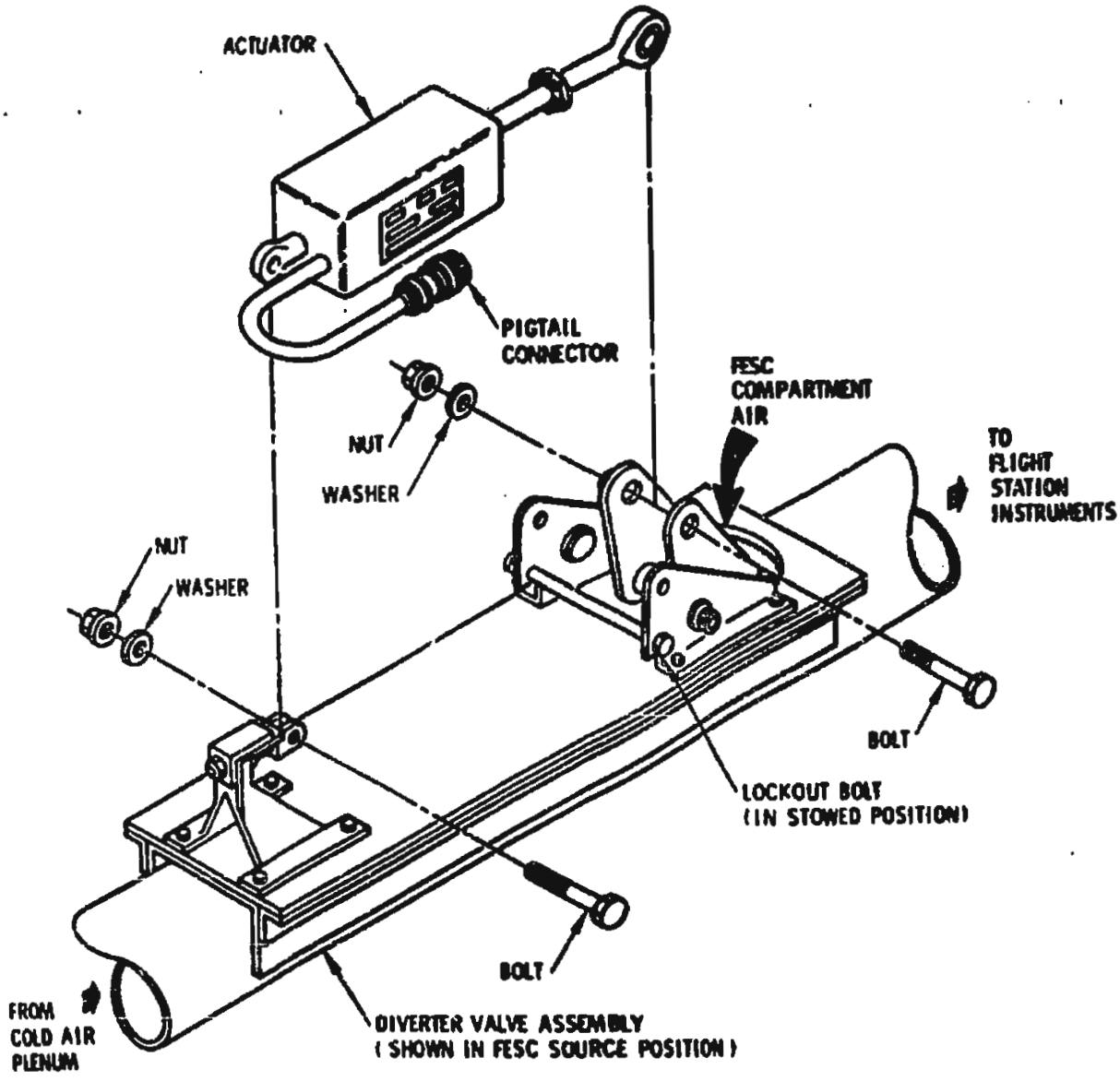

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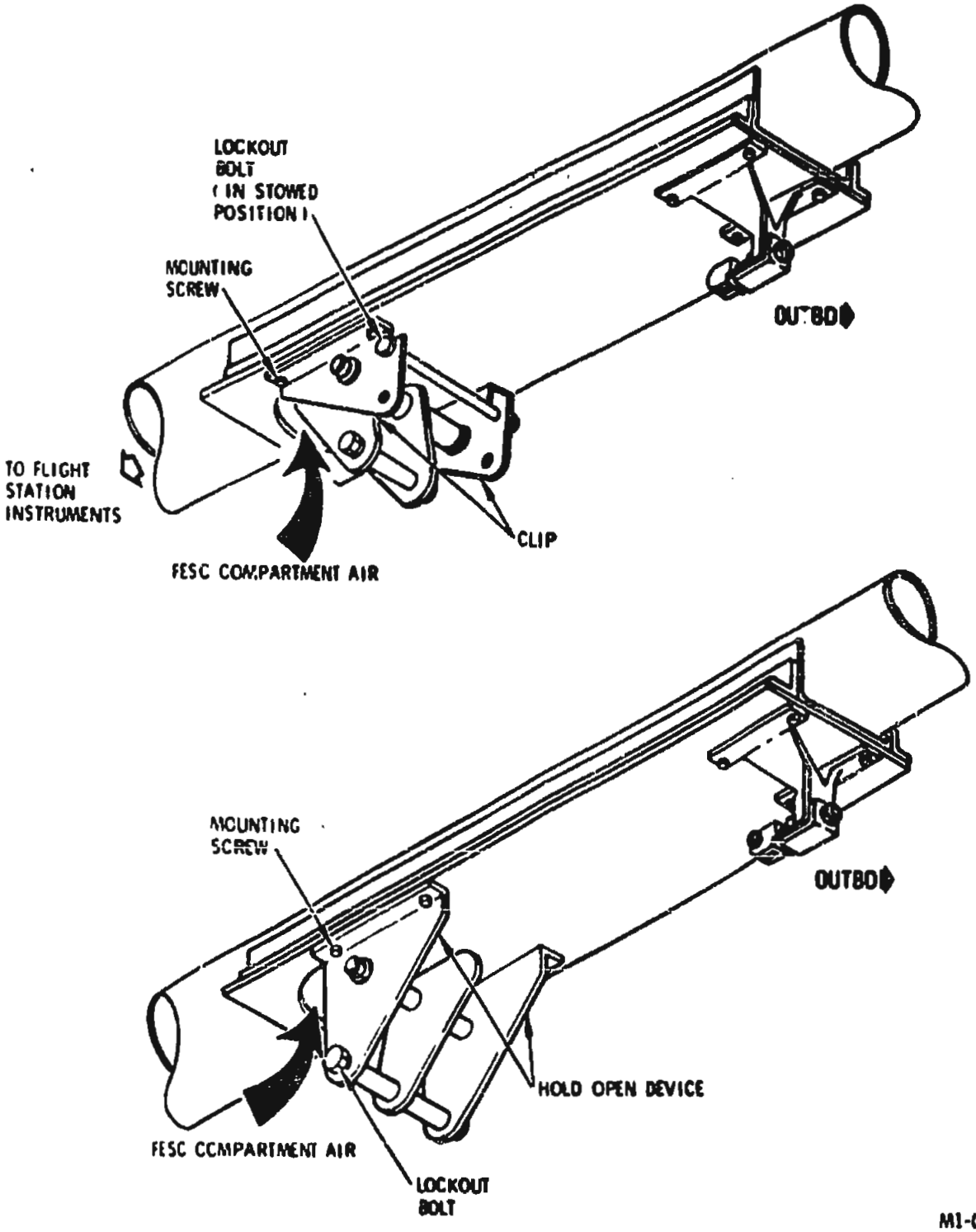
R Instrument Cooling Diverter Valve Actuator
R Removal and Installation
R Figure 202

R EFFECTIVITY: 032-999

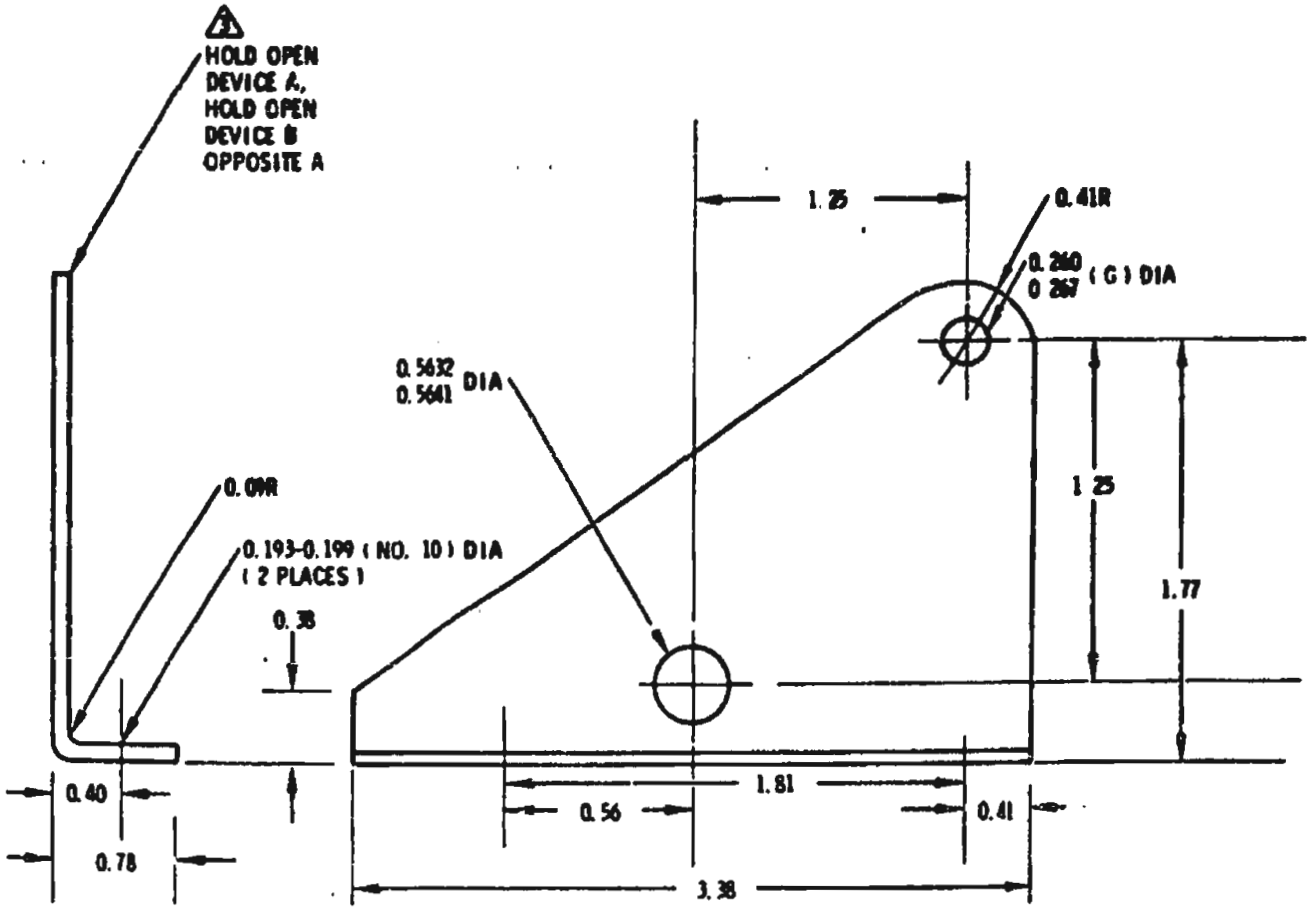
R

001B



R R Instrument Cooling Diverter Valve Deactivation
Figure 203

R R 0018 EFFECTIVITY: 032-999



NOTE

1 MATERIAL: 2020-0 ALCLAD

2 THICKNESS = 0.063

3 TWO REQUIRED
PART A SHOWN
MAKE PART B OPPOSITE
PART A

4 ALL DIMENSIONS IN INCHES

M1-0000-21-2011

R Hold Open Device Manufacturing Sepcifications
R Figure 204

INSTRUMENT COOLING MOISTURE CONTROL MODULATING VALVE REMOVAL AND INSTALLATION

1. Equipment and Materials

O-ring, MS9068-012 or equivalent

Protective gloves

2. Referenced Procedures

24-41-00	External Power/Ground Service System - Maintenance Practices
21-25-40	Instrument Cooling Moisture Control Modulating Valve - Adjustment and Test

3. Removal/Installation

A. Removal

(1) Release and tag both HOT AIR - ISLN VALVE switchlights on Flight Engineer/Second Officer (FE/SO) CABIN TEMP CONTROL panel and verify both flowbars are off. This is to prevent hot air from entering the zone trim manifold if pneumatic system is operating.

WARNING: MODULATING VALVE AND ASSOCIATED COMPONENTS MAY BE EXTREMELY HOT IF PNEUMATIC SYSTEM IS OPERATING. WEAR PROTECTIVE GLOVES WHEN HANDLING HOT COMPONENTS.

(2) Disconnect temperature sensing tube (leading to thermostat) from reducer (Ref. Fig. 401).

(3) Remove reducer from temperature sensing port and discard o-ring.

(4) Disconnect hoses and clamps from valve.

(5) Remove two screws and remove valve from mounting bracket.

B. Installation

(1) Verify both HOT AIR - ISLN VALVE switchlights on FE/SO CABIN TEMP CONTROL panel are released and tagged and their flowbars are off.

(2) Install valve on mounting bracket and tighten screws.

(3) Reconnect hoses and clamps.

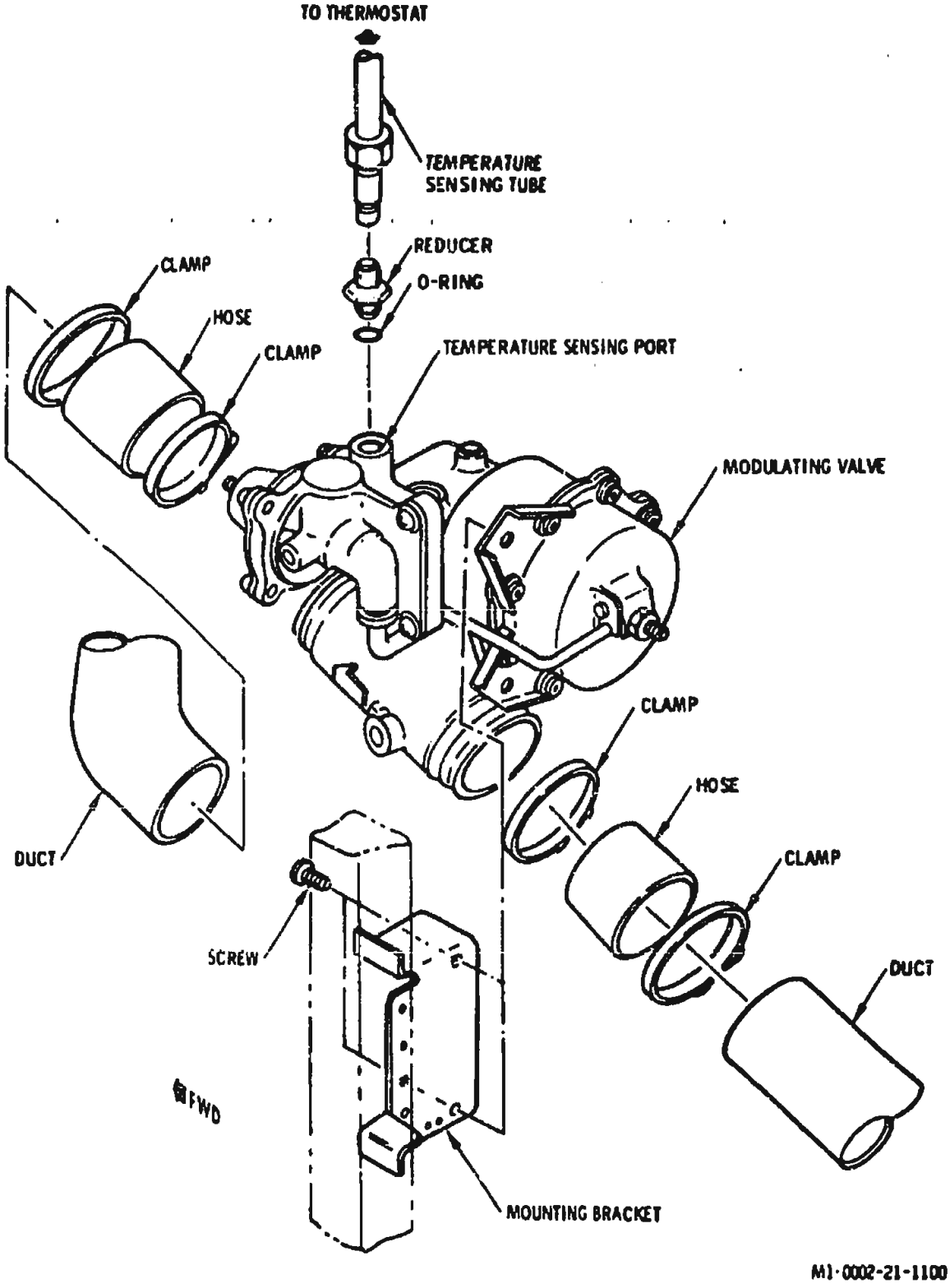
(4) Install new O-ring on reducer and install reducer into temperature sensing port.

(5) Connect temperature sensing tube to reducer.

(6) Verify all connections are secure.

(7) Remove tags and depress HOT AIR - ISLN VALVE switchlights to normal (latched in) position.

(8) Perform functional test (Ref. 21-25-40).



Instrument Cooling Moisture Control Modulating Valve
Removal and Installation
Figure 401

INSTRUMENT COOLING MOISTURE CONTROL MODULATING VALVE ADJUSTMENT AND TEST

1. General

To prevent moisture condensation on the flight station instruments, a moisture control system injects hot air from the trim air manifold into the instrument cooling air taken from the cold air plenum. The Instrument Cooling Moisture Control Modulating Valve regulates the amount of hot air injected to maintain a temperature above 65°F (18°C) and below 75°F (24°C).

The modulating valve may not be adjusted in the aircraft. The following procedure will verify acceptable modulating valve operation. If it is found to be defective, replace it. The modulating valve is located in the aft right portion of the Forward Electronic Service Center (FESC), zone 113.

2. Referenced Procedure

24-00-00	Electrical Power - Maintenance Practices
21-25-40	Instrument Cooling Moisture Control Modulating Valve - Removal and Installation

3. Adjustment/Test

A. Operational Test

(1) Turn on full service electrical power (Ref. 24-00-00).

CR (2) Operate NBR 2 or 3 pack trim air system.

R (3) On Flight Engineer/Second Officer (FE/SO) overhead circuit breaker panel CB2, verify the following circuit breakers are closed:

INSTR - COOLING (A21)

INSTR - GND - COOL (J1)

AVIONICS - AIR - MON (L5)

WARNING: MODULATING VALVE AND ASSOCIATED COMPONENTS MAY BE EXTREMELY HOT IF PNEUMATIC SYSTEM IS OPERATING. WEAR PROTECTIVE GLOVES WHEN HANDLING HOT COMPONENTS.

R (4) Verify the following:

(a) No air leaks in instrument cooling ducts or component couplings.

NOTE: Particular attention should be directed to temperature sensing tube leading from instrument cooling moisture control thermostat to modulating valve (Ref. Fig. 501).

(b) Instrument cooling fan is operating normally.

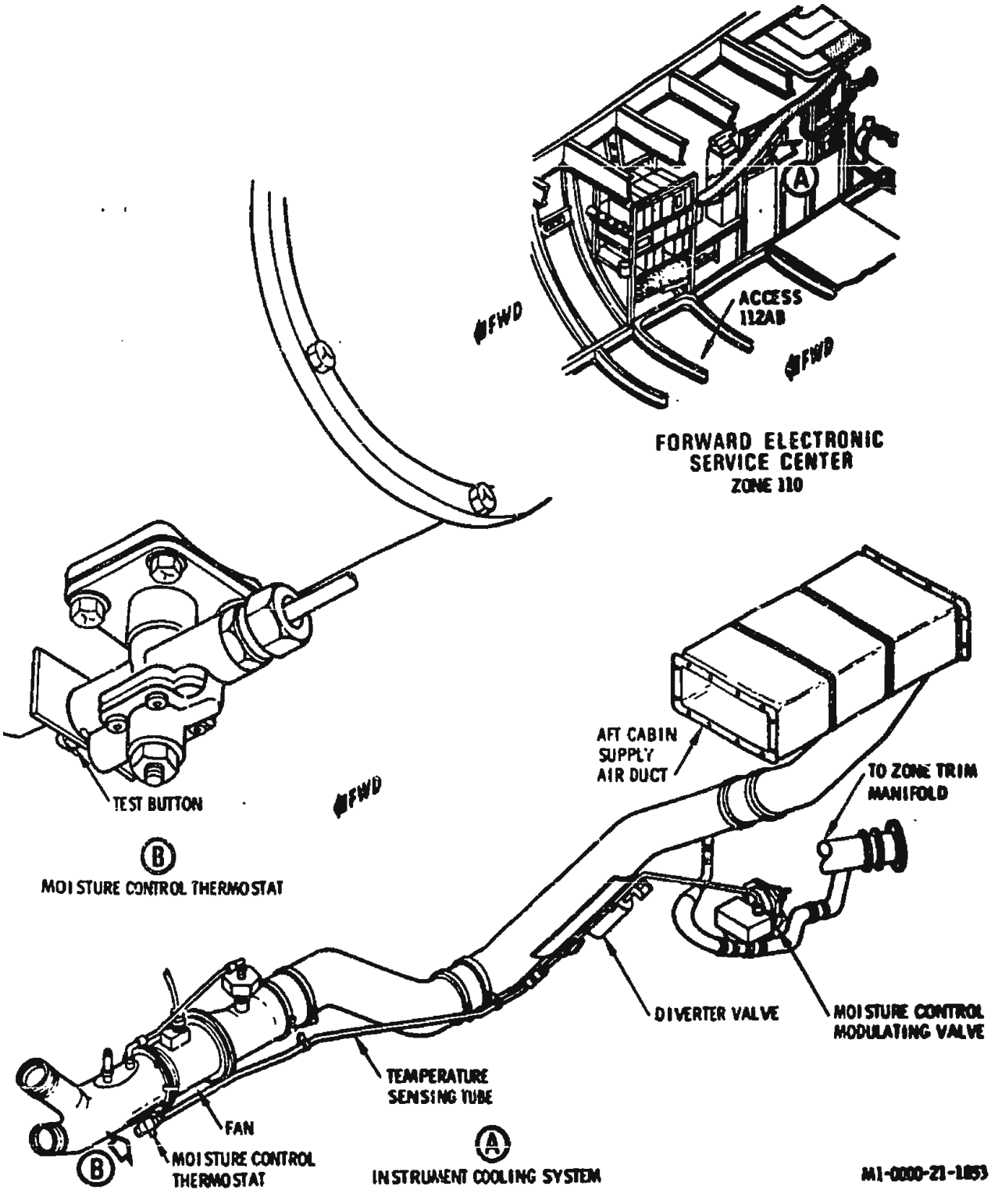
(c) Instrument cooling diverter valve is closed so that no air is entering valve from FESC.

R R (5) Locate test button on instrument cooling moisture control thermostat (Ref. Fig. 501).

R (6) Depress button to bottom and verify valve is opened.

CR (7) Release button and verify valve is closed.

R (8) If valve does not open and close when button is depressed, replace valve (Ref. 21-25-40).



R Instrument Cooling Moisture Control Modulating Valve
R Adjustment and Test
R Figure 501

R EFFECTIVITY: 032-999
R
001B

INSTRUMENT COOLING AIR HIGH TEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps (electrical connector)

Protective plug (switch duct opening)

High Temperature Ground Air Cart

2. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

36-00-00 Pneumatic System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) ELECTRICAL panel, select GROUND SERVICE bus for electrical power (Ref. 24-00-00).

(2) On FE/SO overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker INSTR - GND - COOL (J1).

(3) Disconnect electrical cable connector from switch (Ref. Fig. 401).

(4) Cap electrical cable connector and switch receptacle.

(5) Remove switch from duct.

R (6) Install protective plug in threaded duct opening if new switch is not being installed immediately.

B. Installation

(1) Verify circuit breaker INSTR - GND - COOL (J1) on CB2 panel is open and tagged.

R (2) Remove protective plug from threaded duct opening, if
R installed.

(3) Install temperature switch into duct opening.

(4) Remove protective caps and connect electrical cable connector to switch receptacle.

R C. Operational Test

(1) Locate instrument ground cooling temperature switch on lower side of aft cabin supply air duct in aft part of FESC just forward of the cold air plenum.

(2) Remove electrical cable connector from instrument ground cooling temperature switch and jumper pin A to pin B.

(3) On FE/SO ELECTRICAL panel, select full service electrical power (Ref. 24-00-00).

(4) Remove tag and close circuit breaker INSTR - GND - COOL (J1) on CB2 panel.

(5) Verify PILOT INSTR COOL SYS light on FE/SO annunciator panel is off.

NOTE: If high temperature ground air carts are in use the PILOT INSTR COOL SYS light will be on. If so, remove high temperature air long enough for the cold air plenum to cool off. When cool, the light should be off. No further testing is required.

R (6) Connect high temperature ground air (Ref. 36-00-00).

(7) On FE/SO CABIN TEMP CONTROL panel, depress three PACK FLOW CONTROL switchlights and verify flowbars are on.

WARNING: TO PROTECT THE FLIGHT STATION INSTRUMENTS, PACK
R OPERATION IN MANUAL HOT MUST BE LIMITED TO TWO MINUTES OR LESS.

(8) Release three AUTO/MNL switchlights and verify MNL light is on.

(9) Press three WARM switches and verify TURB BYP and RAM AIR indicators go fully clockwise to hottest position. Limit operation in this mode to two minutes or less.

(10) Verify PILOT INSTR COOL SYS light comes on in approximately one minute.

(11) Depress three AUTO/MNL switchlights and verify AUTO light comes on.

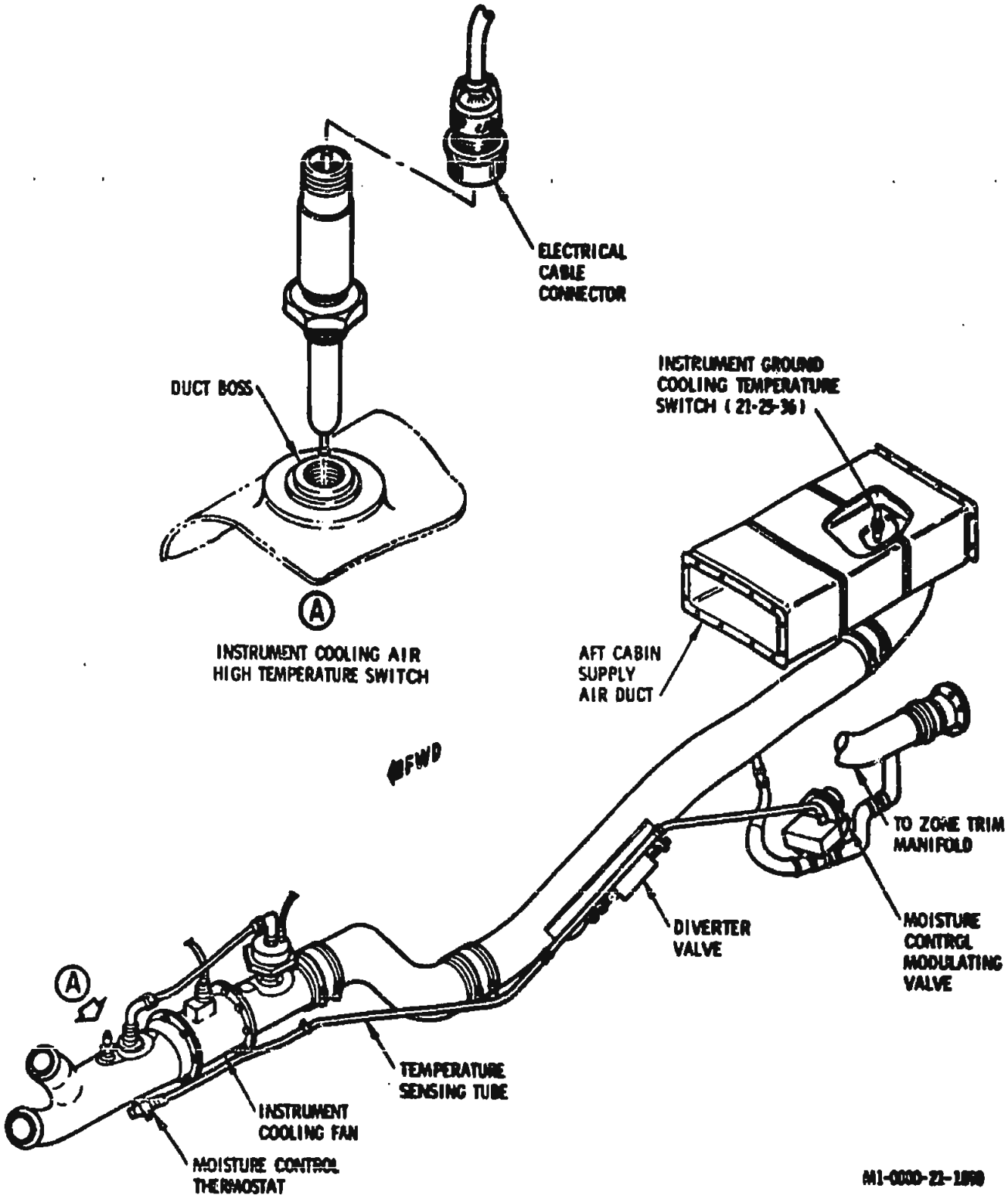
(12) Verify PILOT INSTR COOL SYS light goes off in approximately one minute.

(13) Turn off and disconnect high temperature ground air (Ref. 36-00-00).

(14) Open circuit breaker INSTR - GND - COOL (J1) on CB2 panel.

(15) Remove jumper between pins A and B then reconnect connector to instrument ground cooling temperature switch.

(16) Close circuit breaker INSTR - GND - COOL (J1) on CB2 panel.



R Instrument Cooling Air High Temperature Switch
R Removal and Installation
R Figure 401

LAVATORY SYSTEM - DESCRIPTION AND OPERATION

1. General

This section describes the fresh air supply systems and the air exahust systems for all lavatories.

2. Supply System

Fresh air enters through overhead vents connected to the air conditioning distribution ducts for the passenger cabin or from the passenger cabin through the lavatory doors. See Cabin System, Description and Operation (Ref. 21-23-00) for illustrations and description of ducting that supplies air to the lavatories.

3. Exhaust System

A. Description

The lavatory exhaust system is designed so that it can easily exhaust more air than can enter the lavatories through the overhead supply vents. Otherwise, if the vents were to supply more air than the exhaust system could draw out air contaminated with unpleasant lavatory odors would be forced out through the edges of the lavatory doors and into the passenger cabin. Instead air is drawn into the lavatory through the edges of the doors so that no odors can escape.

Air flows out of each lavatory through the toilet seat area down into the waste tank. From the top of each waste tank (forward and aft), air exhausts directly overboard through a positive ventilation/exhaust system. The forward and aft lavatory exhaust systems are similar, except for differences in flow capacity and the size of components.

On aircraft 034-999,
overboard venting purges odors during pressurized flight, and there is adequate air flow on the ground to prevent odors from escaping from the lavatory into the passenger cabin. Jet pumps force air (80 percent from lavatory compartments and 20 percent from waste tanks) overboard.

Exhaust air from the animal enclosure in the aft cargo compartment is also exhausted through the aft lavatory exhaust system.

When the aircraft is pressurized, air flows out through the lavatory exhaust system because cabin pressure is higher than outside pressure and air naturally flows toward low pressure. When the aircraft is not pressurized, in-flight or on the ground, jet pumps, using air pressure from the pneumatic and air conditioning systems (Ref. 36-14-00 and 21-21-00), induce exhaust system airflow. When pneumatic systems are not operating on the ground, an external source of air pressure can be connected to operate jet pumps.

R On aircraft 001-033,
R each lavatory exhaust system includes a vent air control valve, a vent air check valve, a ground vent air connection, a jet pump, and an exhaust flow control valve. A differential pressure switch is common to both systems.

R On aircraft 034-999,
R each lavatory exhaust system includes a floor level intake
R vent, a muffler, a vent air control valve, a vent air check
R valve, a ground vent air connection, a jet pump, and an
R exhaust flow control valve.

Aircraft altitude is sensed by the differential pressure switch through a static port located to the left of the forward electronic service center access door 112AB, zone 113. Cabin altitude is sensed by the body of the pressure switch. Those items in the vent air portion of the exhaust system are used only when cabin pressure is not available to provide the necessary airflow through the system. The cabin differential pressure sensing jet pump control switch controls both forward and aft lavatory vent air control valves to activate the jet pumps when the cabin is not pressurized.

R On aircraft 001-033,
R the forward lavatory exhaust system, except for its vent air control and check valves, is installed in the aft end of the forward electronic service center, zone 113. The jet pump is mounted vertically on the bulkhead just aft of the waste tank, and the exhaust control valve is below the tank at the bottom of the fuselage. The vent air control valve is in the right environmental control system compartment, zone 118, near the air cycle pack No. 2 supply duct. Air from the No. 2 supply duct is used as vent air system pressure. The vent air check valve, in the line from the control valve to the jet pump and ground vent air connection, is near the forward bulkhead of the right heat exchanger compartment, zone 116. The ground vent air connection is in the lavatory service panel (Ref. Fig. 1).

R On aircraft 034-999,
R the forward lavatory exhaust system also includes the floor

R level intake vent, muffler, and exhaust duct header. The outlet ducts are in the forward left and right lavatory drip
R pans. The muffler is in line from the lavatories in the
R area above the nose landing gear compartment, zone 119. The
R tank vent line passes across the fuselage underfloor, and
R rises up to the exhaust duct header on the left cabin side
R wall, zone 223, before returning to the inlet side of the
R jet pump (Ref. Fig. 1).

The aft lavatory exhaust system is installed in the aft waste system compartment, zone 167. The jet pump is installed vertically just aft of the waste tank, and the exhaust control valve is below the tank in the bottom of the compartment. The vent air control valve is on the compartment bulkhead on the left side near the aft fuselage bleed air duct. Air from the bleed air duct is used as vent air system pressure. The vent air check valve, in the line from the control valve to the jet pump and the ground vent air connection, is below the left end of the waste tank. The ground vent air connection is in the lavatory service panel (Ref. Fig. 2).

Pet air from the aft cargo compartment passes through the pet air exhaust check valve and a duct to join the aft lavatory exhaust system at the top of the waste tank exhaust duct upstream of the jet pump.

B. Operation

Since the forward and aft lavatory exhaust systems are similar except for quantity of airflow, the operation of both systems is the same.

When the cabin is pressurized, airflow from each lavatory into the waste tanks and overboard through the exhaust systems is controlled by the lavatory exhaust control valves. At all normal cabin differential pressures, the forward lavatory exhaust control valve controls the forward system flow to between 62 and 64 cubic feet per minute (cfm), and the aft lavatory exhaust control valve controls the aft system flow to between 170 and 174 cfm. Approximately 10 cfm of the aft system flow is animal enclosure air exhaust from the aft cargo compartment.

When the cabin is not pressurized, the cabin differential pressure sensing jet pump control switch automatically energizes both the forward and aft vent air control valves (Ref. Fig. 3). When these valves open, air pressure from the air cycle pack No. 2 (forward lavatory system) and the aft fuselage bleed air (aft lavatory system) ducts passes through the vent air check valves, past the ground vent air connections, to the jet pumps.

The jet pumps are venturi-shaped sections in the exhaust ducts from the top of the waste tanks to the exhaust control valves in the bottom of each compartment. Vent air pressure is ejected into the center of the throat in each jet pump venturi, which induces near-maximum flow through both exhaust systems. The exhaust control valves pass full jet-pump-induced flow without restriction.

On the ground, when aircraft pneumatic system pressure is not available, a ground air pressure source may be connected at each ground vent air connection. When this is done, the vent air check valves are closed to direct ground vent air to the jet pumps and exhaust system operation is maintained.

4. Exhaust Flow Control Valve

The lavatory exhaust flow control valves are unbalanced, disc-type flow control valves. The disc is unbalanced because the shaft upon which it rotates is attached to the disc at an off-center position, with different valve disc areas on the two sides of the shaft. The disc and shaft assembly are spring-loaded toward the open position (approximately 70 degrees from closed), with the larger half-disc area upstream towards the valve inlet.

The valve controls overboard exhaust airflow from the lavatories at a nearly constant volume of 62 to 64 cubic feet per minute for forward lavatories and 170 to 174 feet per minute from aft lavatories at all normal cabin differential pressures. Flow calibration is made at 8.44 pounds per square inch differential pressure (inlet versus discharge), which is equivalent to a sea-level cabin pressure at a flight altitude of 23,000 feet, or an 8,000-foot cabin pressure at a flight altitude of 42,000 feet.

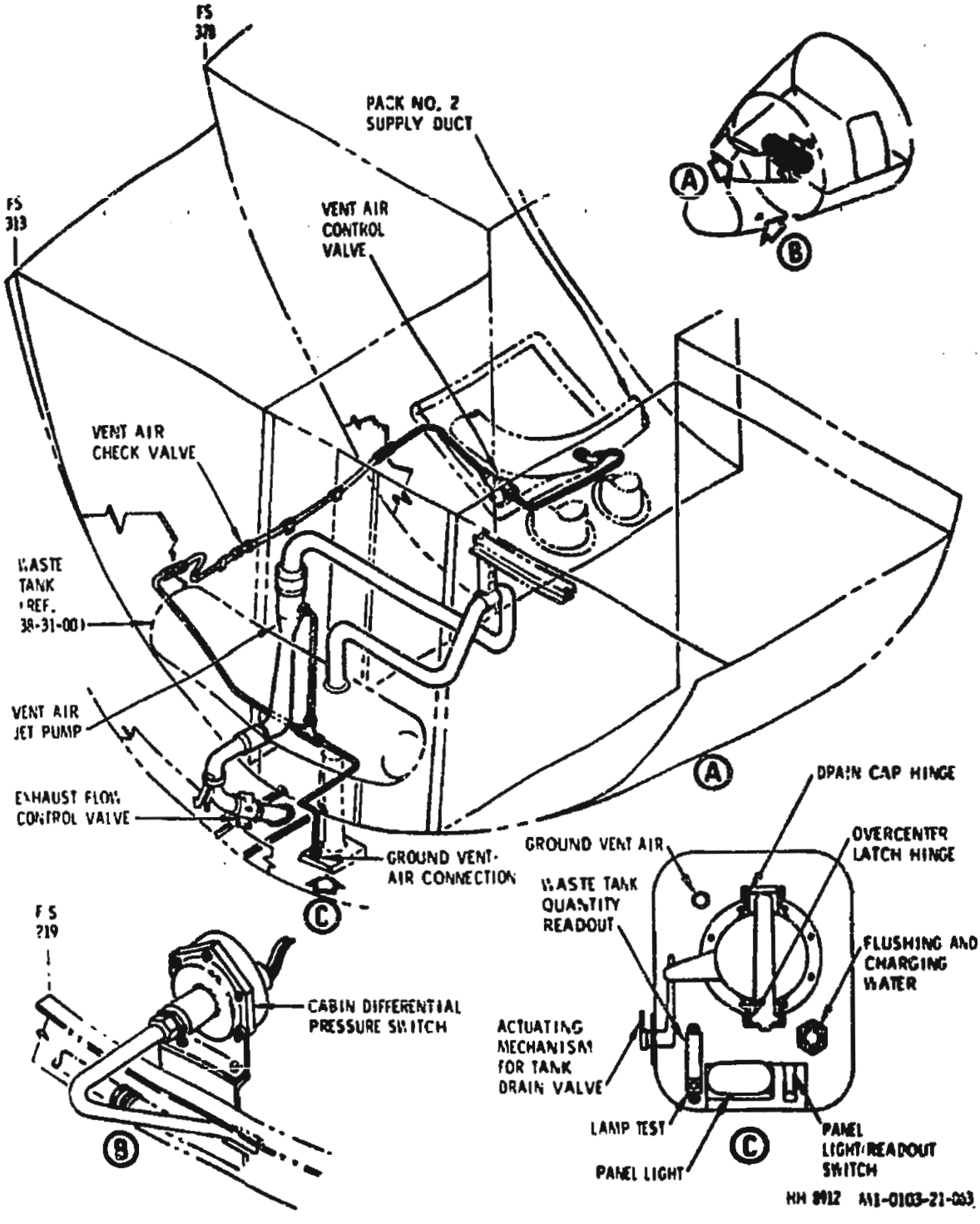
The forward lavatory exhaust flow control valve is installed in the bottom of the forward electronics service center, zone 113, under the forward lavatory waste tank. The valve discharges air from the lavatory exhaust system directly overboard through an opening in the bottom of the fuselage.

The aft lavatory exhaust flow control valve is installed in the bottom of the aft waste system compartment, zone 167, below the aft waste tank. The valve discharges air from the lavatory exhaust system directly overboard through an opening in the bottom of the fuselage.

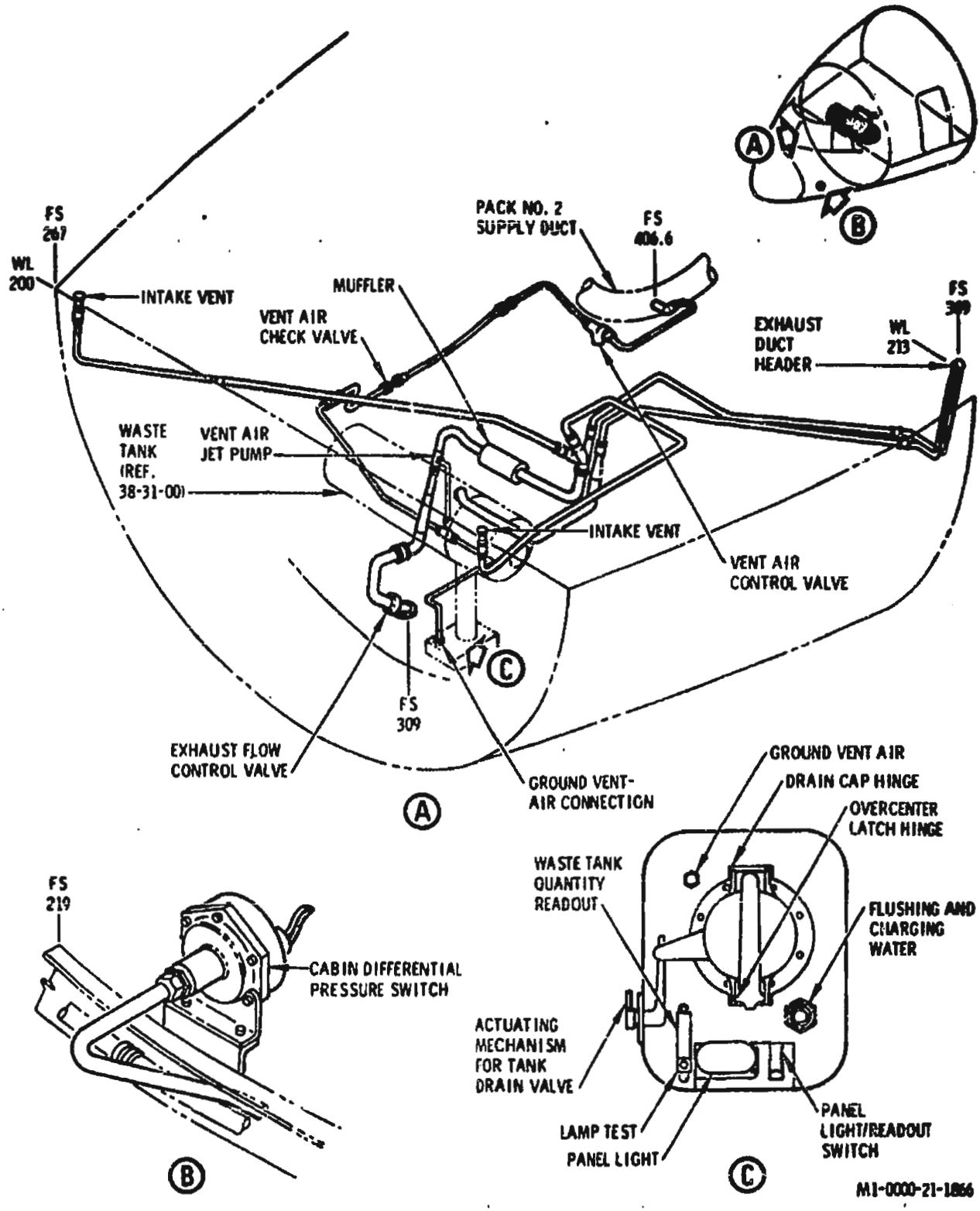
As exhaust air flows through the flow control valve (because of cabin differential pressure), the unbalanced disc is moved towards the closed position against spring pressure. As the valve inlet pressure increases, the disc is forced further

towards the closed position with a corresponding increase in flow restriction. Spring pressure opposing closure of the valve is calibrated to match air movement pressure, so that flow is nearly constant throughout the normal range of inlet pressures.

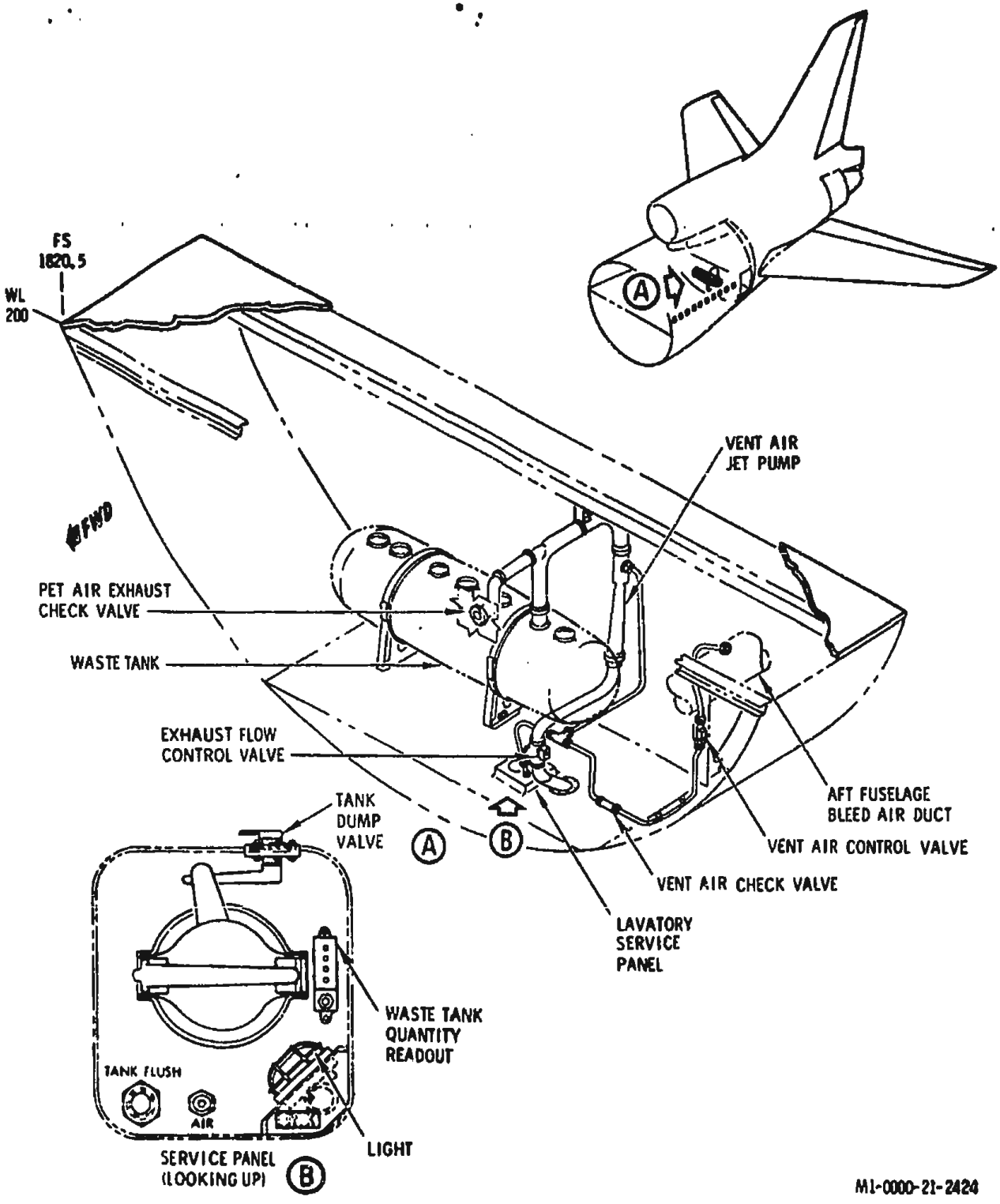
When the cabin is not pressurized, lavatory exhaust air flow is induced by a solenoid-controlled jet pump near the waste tank. The exhaust flow control valve passes full jet-pump-induced flow without restriction.



Forward Lavatory Exhaust System
Figure 1



R Forward Lavatory Exhaust System
R Figure 1



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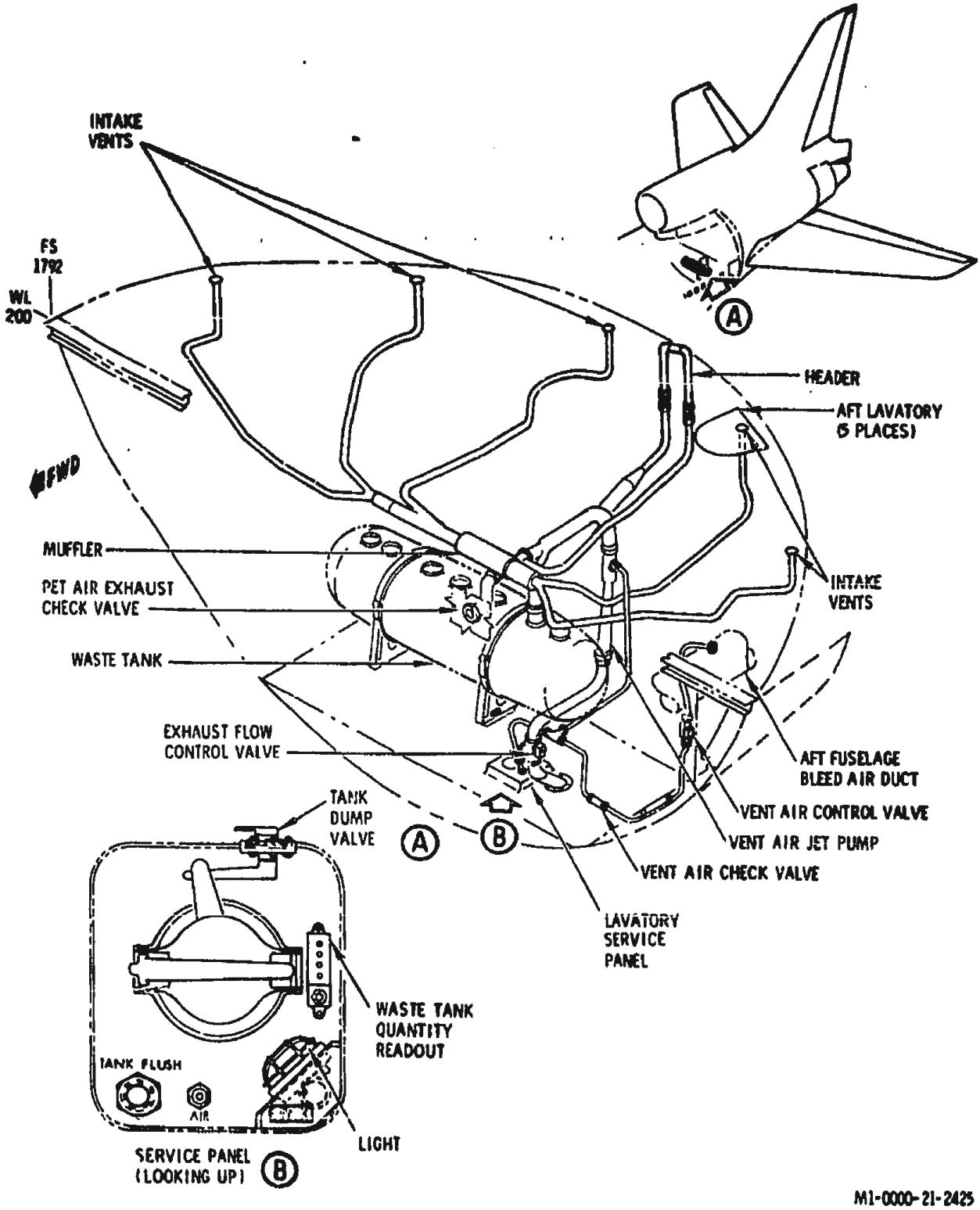
Aft Lavatory Exhaust System
Figure 2



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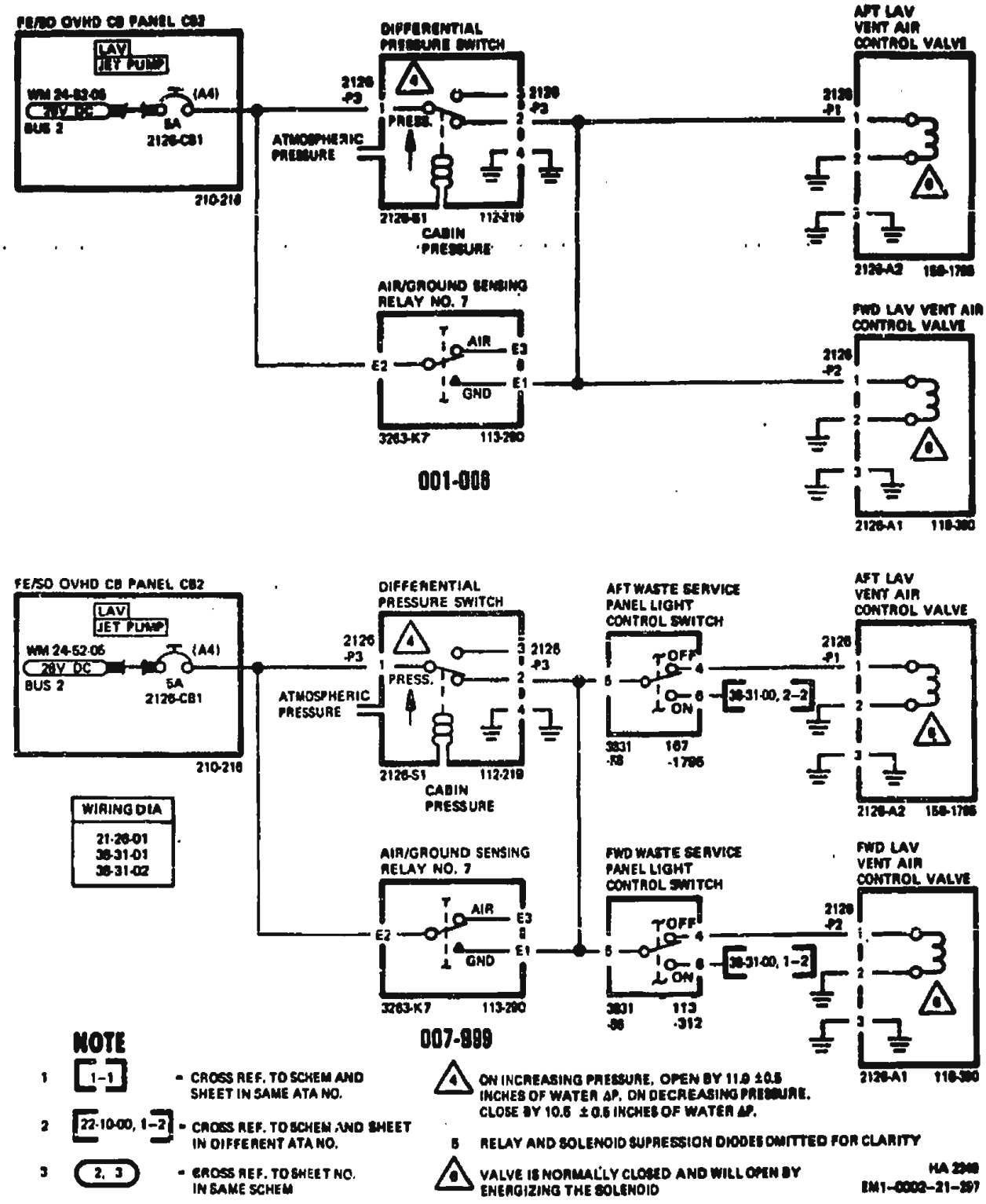
Aft Lavatory Exhaust System
Figure 2



NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1-2] - CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM

4. ON INCREASING PRESSURE, OPEN BY 11.0 ±0.5 INCHES OF WATER ΔP. ON DECREASING PRESSURE, CLOSE BY 10.5 ±0.5 INCHES OF WATER ΔP.
5. RELAY AND SOLENOID SUPRESSION DIODES OMITTED FOR CLARITY
6. VALVE IS NORMALLY CLOSED AND WILL OPEN BY ENERGIZING THE SOLENOID

HA 2948
EM1-0302-21-297

R Lavatory Jet Pump Control Schematic
R Figure 4

EFFECTIVITY: ALL

R # LAVATORY SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting lavatory system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the lavatory system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
SCHEM 1	Lavatory Jet Pump Control Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKER–LAV JET PUMP 2126–CB1	1	FE/SO OVERHEAD CIRCUIT BREAKER PANEL (CB2) (A4)	•
JET PUMP–AFT LAVATORY VENT AIR	1	AFT CARGO COMPARTMENT LINER PANEL 1618L	21–26–07
JET PUMP–FORWARD LAVATORY VENT AIR	1	AFT END OF FESC BEHIND WASTE TANK (FS320)	21–26–06
RELAY–AIR/GROUND SENSING 3263–K7	1	RIGHT SIDE OF FESC, RELAY PANEL AT FS290	•
SWITCH–AFT WASTE SERVICE PANEL LIGHT CONTROL 3831–S8	1	AFT WASTE SERVICE PANEL FS1800	•
SWITCH–DIFFERENTIAL PRESSURE–JET PUMP CONTROL 2126–S1	1	NEAR LEFT SIDE OF FESC ACCESS DOOR	•
SWITCH–FORWARD WASTE SERVICE PANEL LIGHT CONTROL 3831–S8	1	FORWARD WASTE SERVICE PANEL FS312	•
VALVE–LAVATORY EXHAUST FLOW CONTROL–AFT	1	BEHIND AFT CARGO COMPARTMENT LINER PANEL 1618L	21–26–09
VALVE–LAVATORY EXHAUST FLOW CONTROL–FORWARD	1	AFT END OF FESC BELOW WASTE TANK FS300	21–26–08
VALVE–LAVATORY VENT AIR CONTROL–AFT	1	BEHIND AFT CARGO COMPARTMENT LINER PANEL 1618L LEFT SIDE	21–26–03
VALVE–LAVATORY VENT AIR CONTROL–FORWARD	1	ENVIRONMENTAL CONTROL SYSTEM (ECS) COMPARTMENT, ACCESS DOOR 118CR INBOARD AND FORWARD OF DOOR	21–26–02

*SEE WM EQUIPMENT LIST

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R
R

Component Location Index
Figure 101

EFFECTIVITY: ALL

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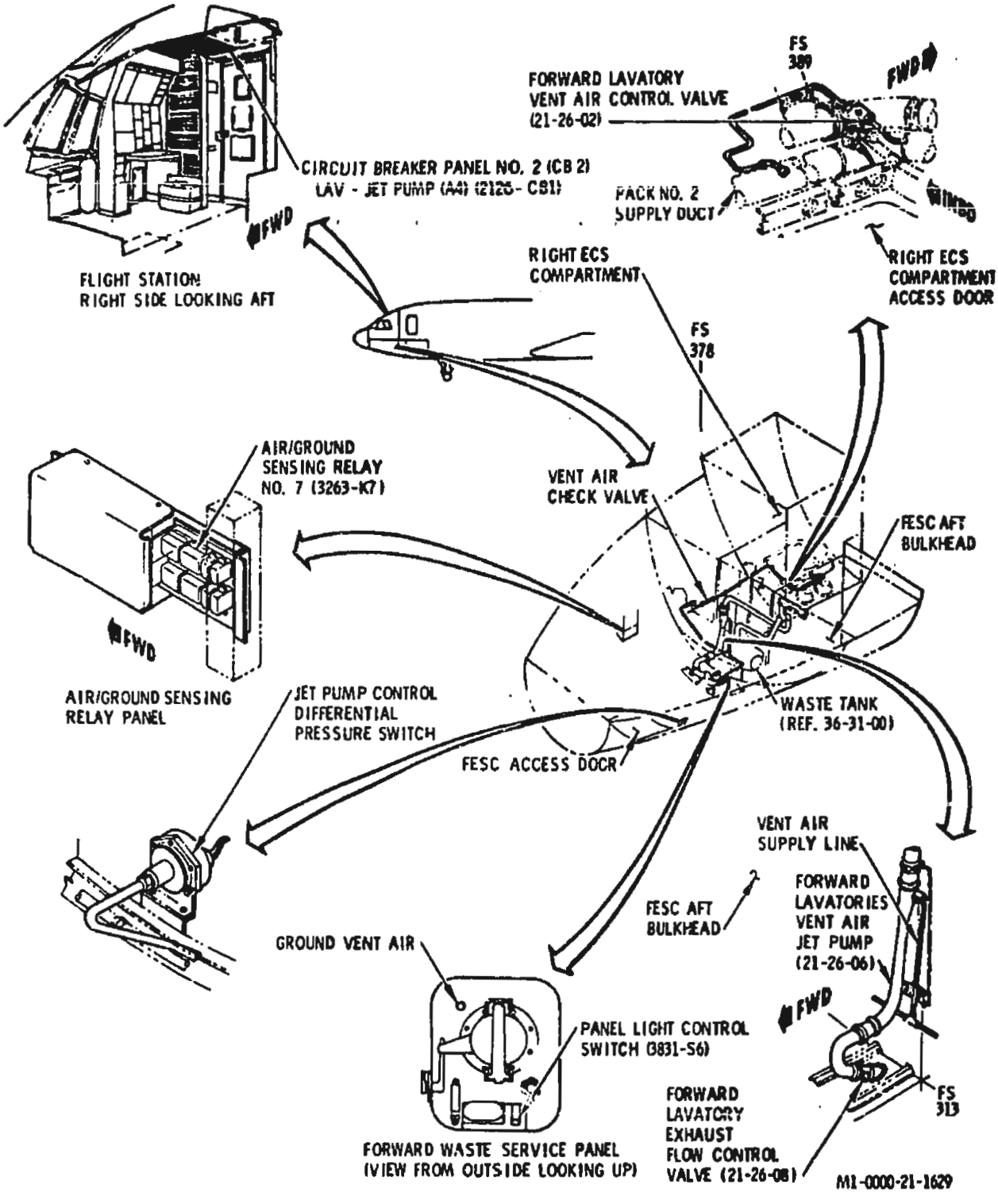

R
R Component Locator Diagram
Figure 102 (Sheet 1)

EFFECTIVITY: ALL

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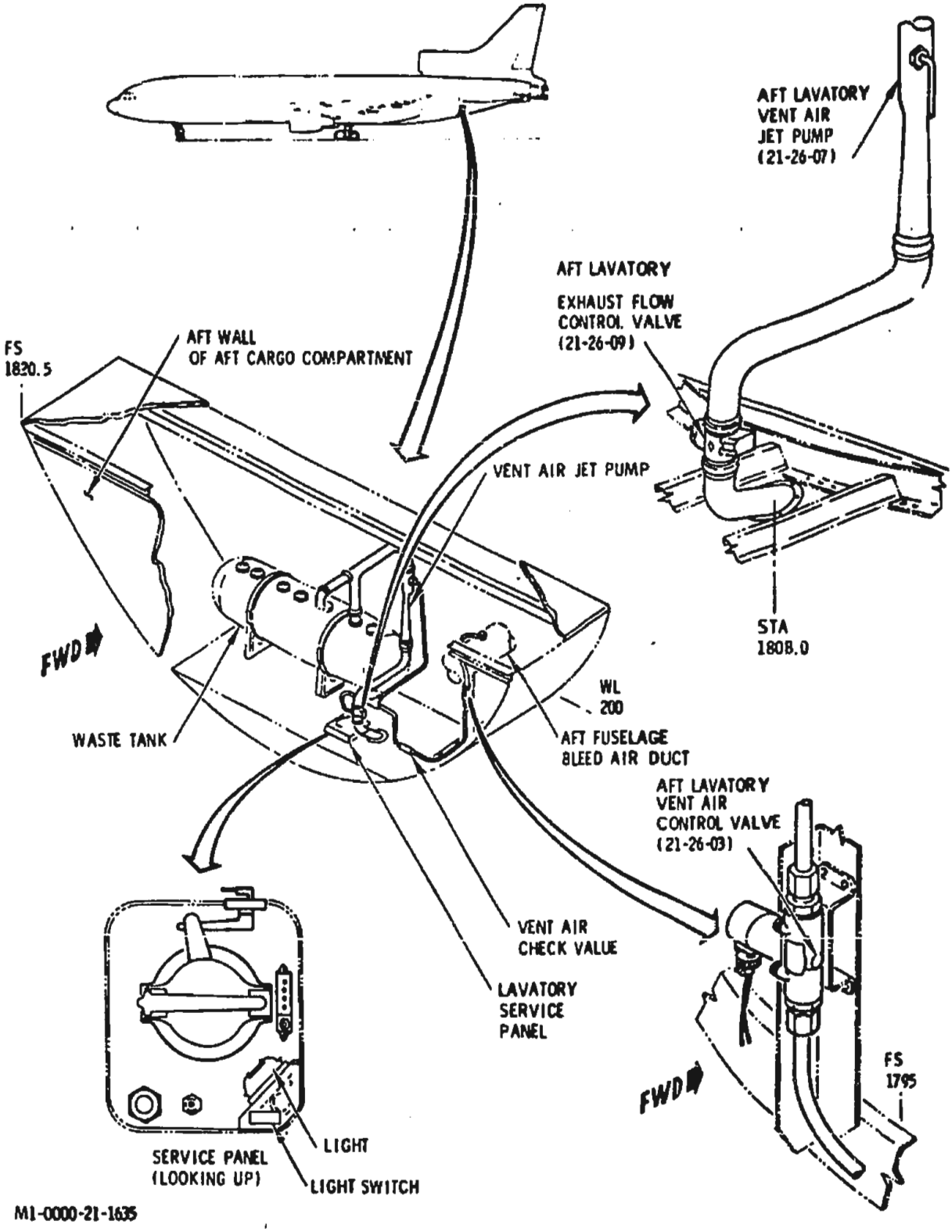

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Component Locator Diagram
Figure 102 (Sheet 2)

EFFECTIVITY: ALL

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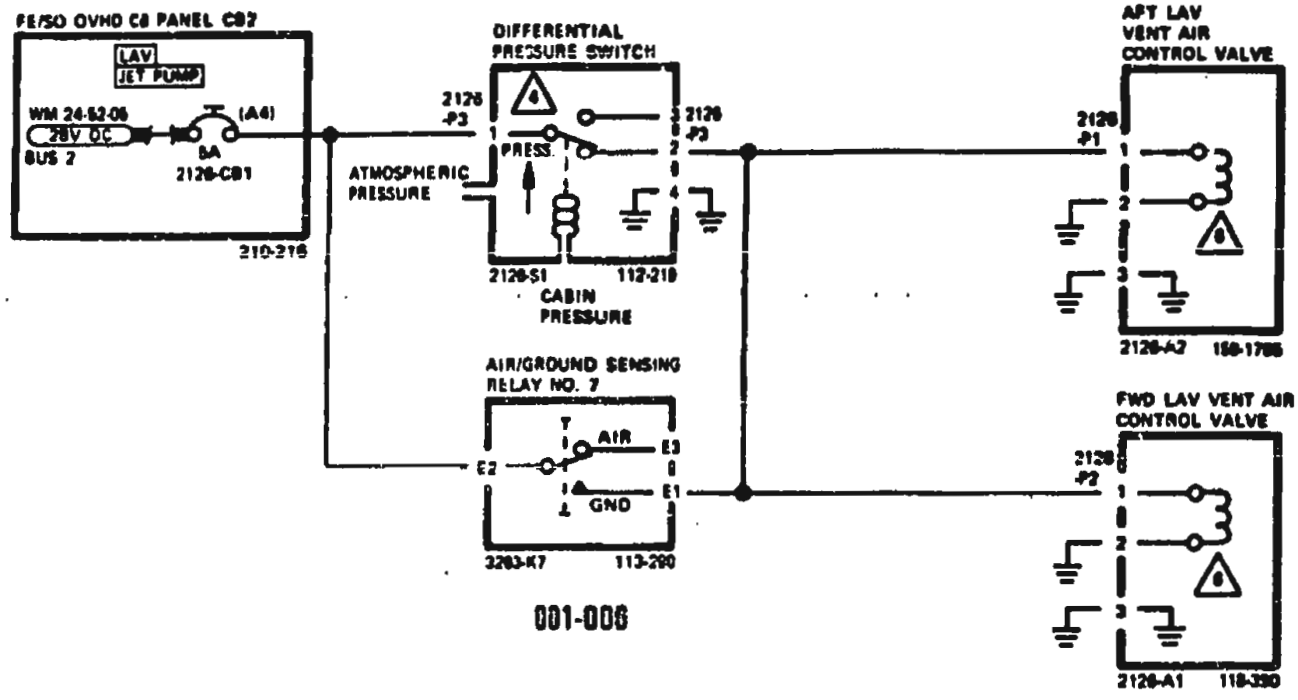
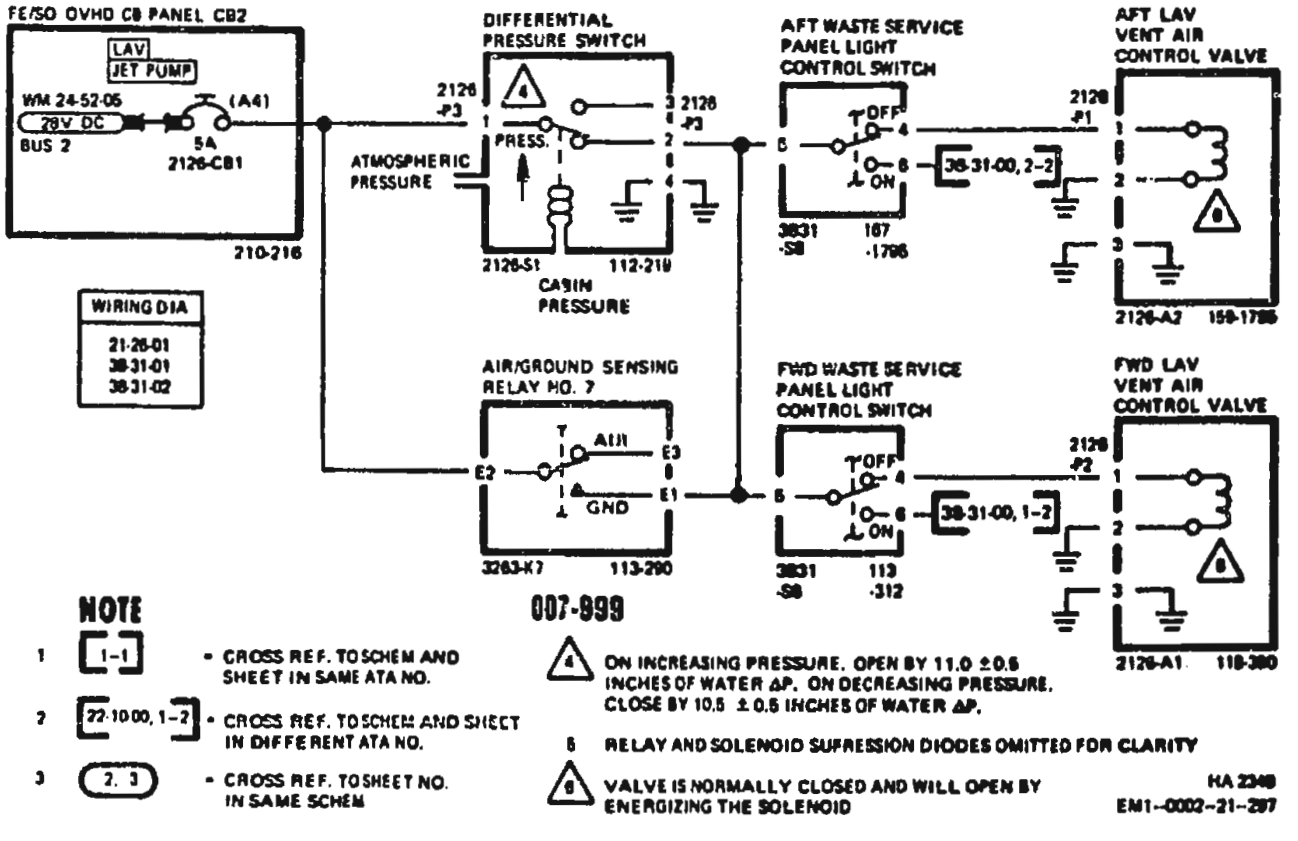




NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-1000, 1-2] - CROSS REF. TO SCHEM AND SHEET IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM

4. ON INCREASING PRESSURE, OPEN BY 11.0 ±0.5 INCHES OF WATER ΔP. ON DECREASING PRESSURE, CLOSE BY 10.5 ±0.5 INCHES OF WATER ΔP.
5. RELAY AND SOLENOID SUPRESSION DIODES OMITTED FOR CLARITY
6. VALVE IS NORMALLY CLOSED AND WILL OPEN BY ENERGIZING THE SOLENOID

HA 2348
EM1-0002-21-297

R Lavatory Jet Pump Control Schematic
R SCHEM 1

EFFECTIVITY: ALL

0018

FORWARD LAVATORY VENT AIR CONTROL VALVE - REMOVAL AND INSTALLATION

1. Equipment and Materials

Protective caps

2. Referenced Procedure

R 06-40-00 Exterior Access Doors and Panels Zone 100

24-00-00 Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers ENGINE BLEED
R CONTROL panel and APU CONTROL panel to prevent
R operation until completion of procedure.

R (2) On Flight Engineer/Second Officers overhead circuit
R breaker panel, CB2, zone 210, open and tag circuit
R breaker LAV - JET PUMP (A4).

R (3) Tag the three high-pressure ground air connections to
R prevent operation until completion of procedure.

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED
R WHEN REQUIRED.

R (4) Open environmental control system (ECS) compartment
R access door 118CR (Ref. 06-40-00).

R (5) Disconnect electrical connector from control valve
R (Ref. Fig. 401).

R (6) Install protective caps on plug and receptacle.

R (7) Disconnect air lines from control valve.

R (8) Remove screws and nuts attaching valve to bracket and
R remove valve.

R (9) Install protective caps on air lines and valve ports.

B. Installation

R (1) Verify that all tags installed in Steps 3A(1), (2) and
R (3) are in place.

(2) Remove protective caps from valve ports and air lines.

(3) Position valve on bracket and install attaching screws and nuts.

(4) Connect air lines to valve.

(5) Remove protective caps and connect electrical connector.

(6) Test operation of valve as follows:

(a) Turn on electrical power (Ref. 24-00-00).

(b) Station observer at valve to verify solenoid operation by sound or feel.

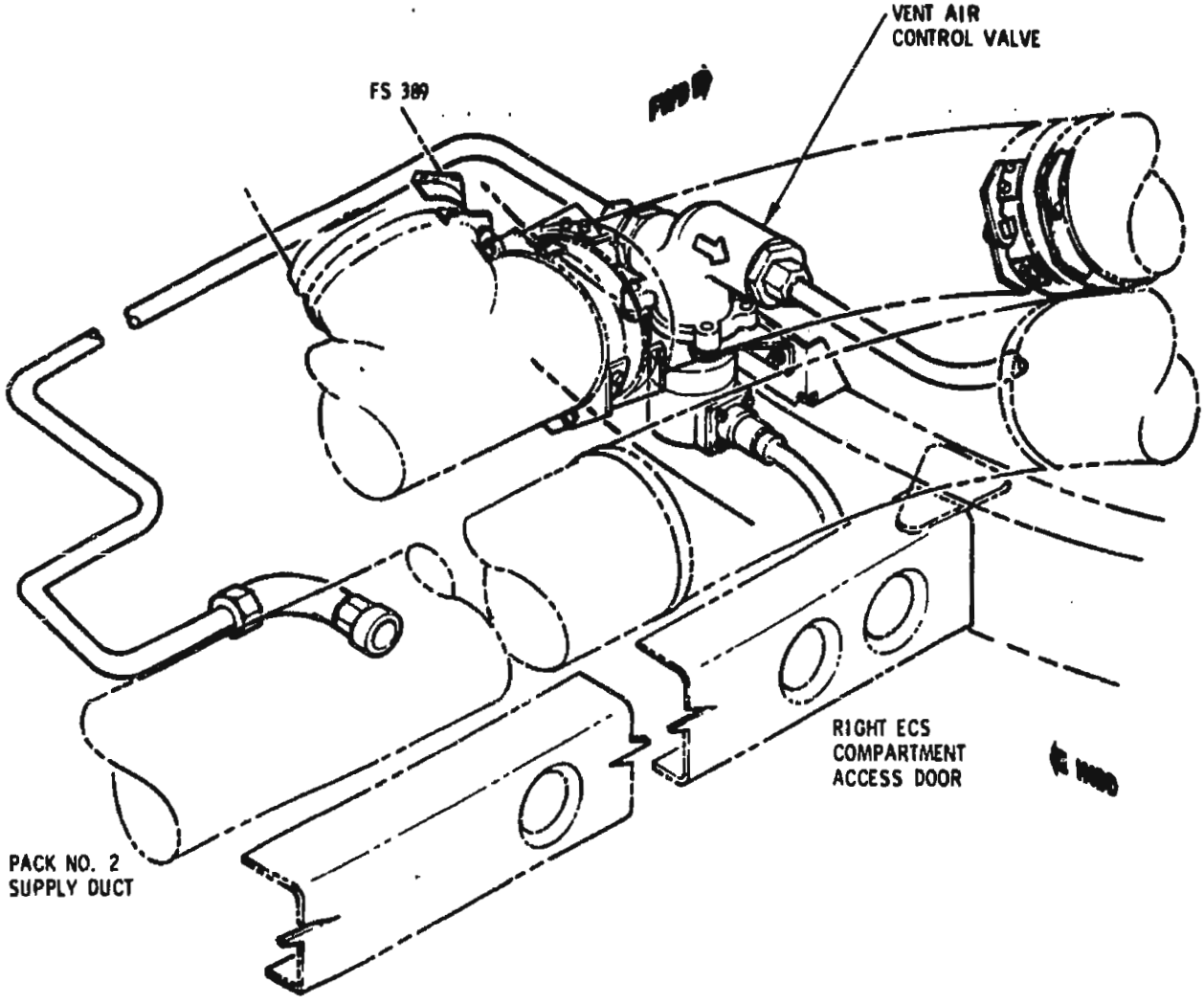
(c) Remove tag and close circuit breaker opened in
R Step 3A(2).

(d) Verify that solenoid operates when circuit breaker is closed.

(e) Turn off electrical power (Ref. 24-00-00).

(7) Close ECS compartment access door.

R (8) Remove tags installed in Steps 3A(1) and (3).



HH 9991
M1-0100-21-267

R Forward Lavatory Vent Air Control Valve - Removal and Installation
R Figure 401

AFT LAVATORY VENT AIR CONTROL VALVE - REMOVAL AND INSTALLATION

1. General

R NOTE: The aft lavatory exhaust duct heater system has been
R deactivated by Alert SB21-A180 or in production.

The aft lavatory exhaust system includes a vent air control valve, air check valve, jet pump, exhaust flow control valve, duct heater and thermal switch connected together in the aft cargo compartment zone 167. The air is drawn from the aft bleed air duct through vent air control valve, check valve, jet pump and discharged overboard through the exhaust flow control valve. Location and access to the aft lavatory vent air control valve is in the aft cargo compartment through access lines panel 161BL.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

6-50-00	Interior Access Doors and Panels
24-00-00	Electrical Power - Maintenance Practices
25-51-06	Aft Cargo Compartment Liner - Removal and Installation

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) bleed air
R and APU control panels and the three high-pressure
R ground air connections to prevent operation until
R completion of procedures.

R (2) On Flight Engineer/Second Officers overhead circuit
R breaker panel CB2, zone 215, open and tag circuit
R breaker LAV - JET PUMP (A4).

R (3) Remove aft cargo compartment liner panel 161BL (Ref.
R 25-51-06).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED
R WHEN REQUIRED.

R (4) Disconnect electrical connector from control valve
R (Ref. Fig. 401).

R (5) Install protective caps on plug and receptacle.

R (6) Disconnect air lines from control valve.

R (7) Remove screws and nuts attaching valve to bracket and
R remove valve.

R (8) Install protective caps on air lines and valve ports.

B. Installation

R (1) Verify that tags previously installed on FE/SO bleed
R air and APU control panels and the three high-pressure
R ground air connections are in place.

R (2) Verify that circuit breaker opened in Step 4A(1) is
R open and tagged.

R (3) Remove protective caps from valve ports and air lines.

R (4) Position valve on bracket and install attaching screws
R and nuts.

R (5) Connect air lines to valve.

R (6) Remove protective caps and connect electrical
R connector.

R (7) Test operation of valve as follows:

(a) Turn on electrical power (Ref. 24-00-00).

(b) Station observer at valve to verify solenoid operation by sound or feel.

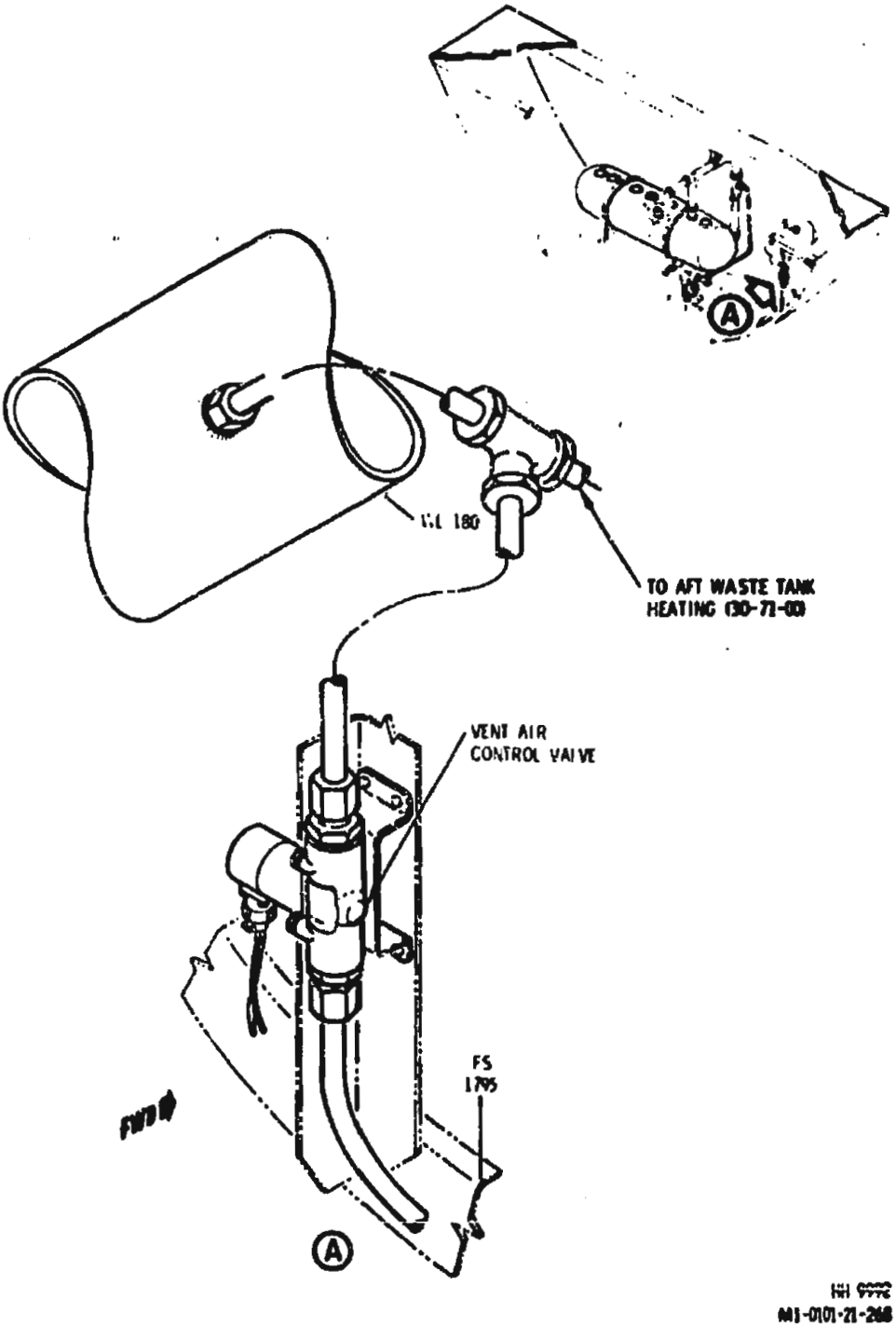
(c) Remove tag and close circuit breaker opened in Step 4A(1).

(d) Verify that solenoid operates when circuit breaker is closed.

(e) Turn off electrical power (Ref. 24-00-00).

R (8) Install cargo compartment liner panel removed in Step
R 4A(2)

R (9) Remove tags installed at beginning of Paragraph 4.



Aft Lavatory Vent Air Control Valve - Removal and Installation
Figure 401

FORWARD LAVATORY VENT AIR JET PUMP - REMOVAL AND INSTALLATION

1. General

The forward lavatory exhaust system includes a vent air control valve, air check valve, jet pump, and exhaust flow control valve
R which are connected together in the forward electronic service center (FESC) zone 113. The air is drawn from the air cycle pack NO. 2 supply duct through vent air control valve, air check valve, jet pump and discharged overboard through the exhaust flow control valve. Location and access to the forward lavatory vent air jet pump is in the FESC through access door 112AB.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

6-50-00 Interior Access Doors and Panels

4. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT OPERATION UNTIL COMPLETION OF PROCEDURES.

A. Removal

(1) Open access door 112AB.

(2) Disconnect pressure line from jet pump fitting. Install protective caps on line and fitting (Ref. Fig. 401).

(3) Remove hose clamps from top and bottom jet pump hose connections.

(4) Work hoses off of jet pump onto ducts.

(5) Support jet pump and remove mounting screws and nuts in brackets on bulkhead.

(6) Remove jet pump from behind waste tank.

(7) Install protective caps on open ducts.

B. Installation

(1) Remove protective caps from ducts.

(2) Position jet pump behind waste tank and install mounting screws and nuts.

(3) Position connector hoses on jet pump and install clamps.

(4) Remove protective caps and connect pressure line.

(5) Test operation of jet pump as follows:

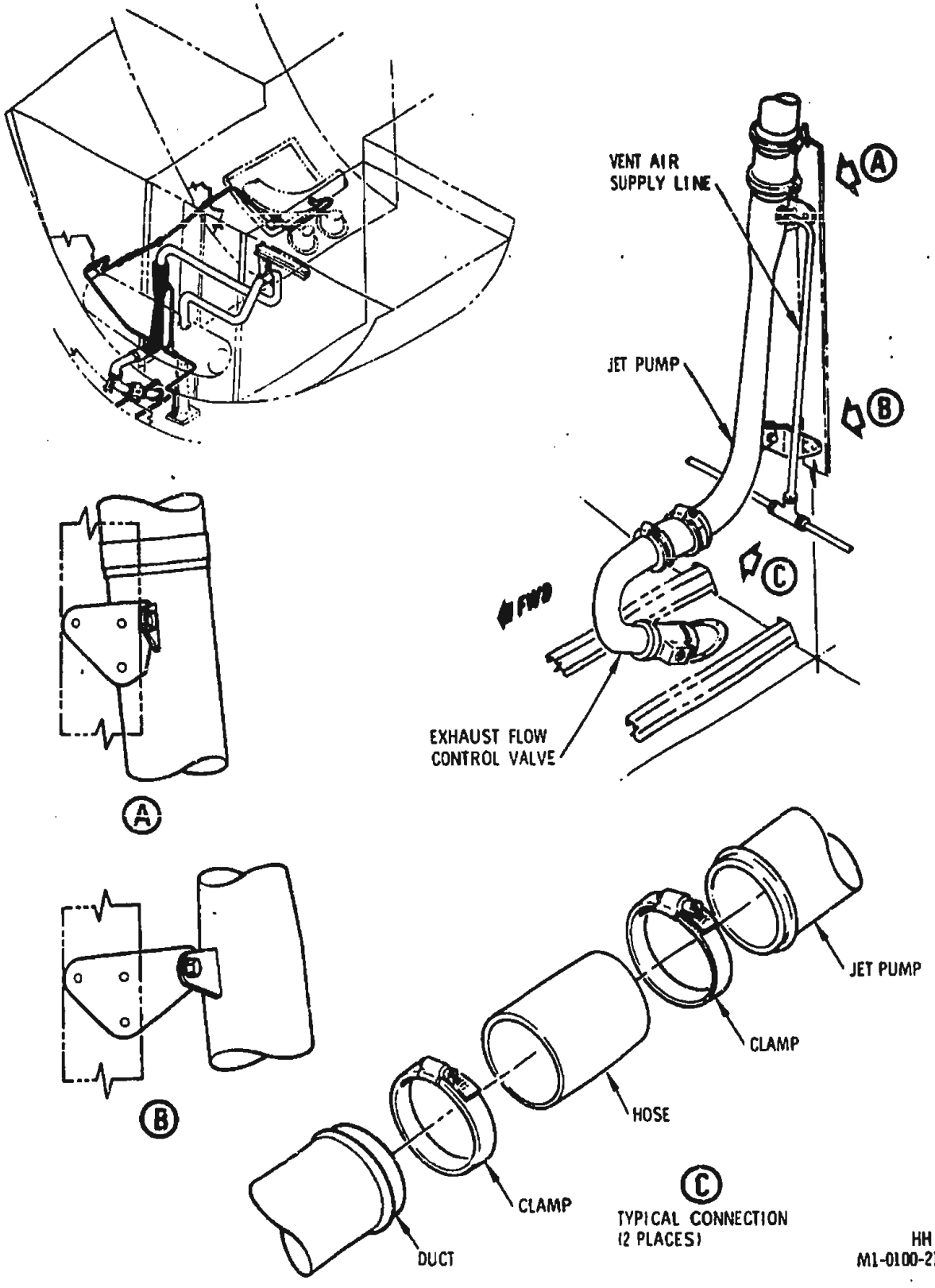
(a) On forward lavatory waste system service panel, connect a 45 to 50 psi air supply to the AIR connection.

(b) Note operation of exhaust air system in the lavatories to confirm jet pump operation.

(c) Disconnect air supply.

(6) Close access door opened in Step 4A(1).

(7) Remove tags installed at beginning of Paragraph 4.



R Forward Lavatory Vent Air Jet Pump - Removal and Installation
R Figure 401

R FORWARD LAVATORY VENT AIR JET PUMP - ADJUSTMENT AND TEST

R 1. Equipment and Materials

R Light gauge Polythene (thin sheet plastic)

R 2. Referenced Procedure

R 49-00-01 Auxiliary Power Unit (APU) - Adjustment and Test

R 3. Adjustment/Test

R A. Functional Check

R (1) Look up forward lavatory waste tank vent exhaust pipe
R from outside aircraft.

R (2) Use flashlight and mirror to inspect flow control valve
R for blockage.

R (3) Remove debris and ensure butterfly is free to operate.

R (4) Start APU and select NORM mode (Ref. 49-00-01).

R (5) Latch in BLEED AIR S/O valve switchlight, verify OPEN
R light on.

R (6) Latch in Aft Fuselage ISLN VALVE and No. 2 PACK FLOW
R CONTROL valve and verify flowbars are on.

R CAUTION: DO NOT LET GO OF PLYTHENE SHEET.

R (7) Check airflow through one toilet pan by stretching a
R sheet of light gauge polythene across the pan with the
R seat lifted.

R NOTE: If the flow is adequate, the sheet will be
R sucked gently downwards.

R (8) If airflow is inadequate jet pump should be removed for
R cleaning.

AFT LAVATORY VENT AIR JET PUMP - REMOVAL AND INSTALLATION

1. General

R The aft lavatory exhaust system includes a vent air control valve, air check valve, jet pump and exhaust flow control valve
R connected together in the aft cargo compartment zone 167. The air is drawn from the aft bleed air duct through a vent air control valve, check valve, jet pump and discharged overboard through the exhaust flow control valve. Location and access to the aft lavatory vent jet pump is in the aft cargo compartment through access liner panel 161BL.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

20-21-01	Swaged Flexible Coupling - Removal and Installation
25-51-06	Aft Cargo Compartment Liner - Removal and Installation

4. Removal/Installation

A. Removal

(1) Tag Flight Engineer/Second Officers BLEED AIR CONTROL panel and APU CONTROL panel to prevent operation until completion of procedure.

(2) On Flight Engineer/Second Officers (FE/SO) overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker LAV - JET - PUMP (A4).

R (3) Deleted

(4) Tag the three high pressure ground air connections to prevent operation until completion of procedure.

(5) Remove aft cargo compartment liner panel 161BL (Ref. 25-51-06).

(6) Remove screws holding bracket and thermal switch to top of jet pump (Ref. Fig. 401). Secure switch and bracket out of way.

(7) Disconnect pressure line from jet pump fitting. Install protective caps on line and fitting.

(8) Disconnect flexible coupling at lower end of jet pump (Ref. 20-21-01).

(9) Support jet pump and disconnect flexible coupling at upper end.

(10) Remove jet pump from behind waste tank.

(11) Install protective caps on open ducts.

B. Installation

(1) Verify that all tags installed in Steps 4A(1), (2), (3) and (4) are in place.

(2) Remove protective caps from ducts and ensure flexible couplings are ready for installation (Ref. 20-21-01).

(3) Position jet pump and loosely connect couplings.

(4) Remove protective caps and connect pressure line to jet pump.

(5) Tighten and lock-wire flexible couplings (Ref. 20-21-01).

(6) Reinstall thermal switch and bracket on jet pump.

(7) Test operation of jet pump as follows:

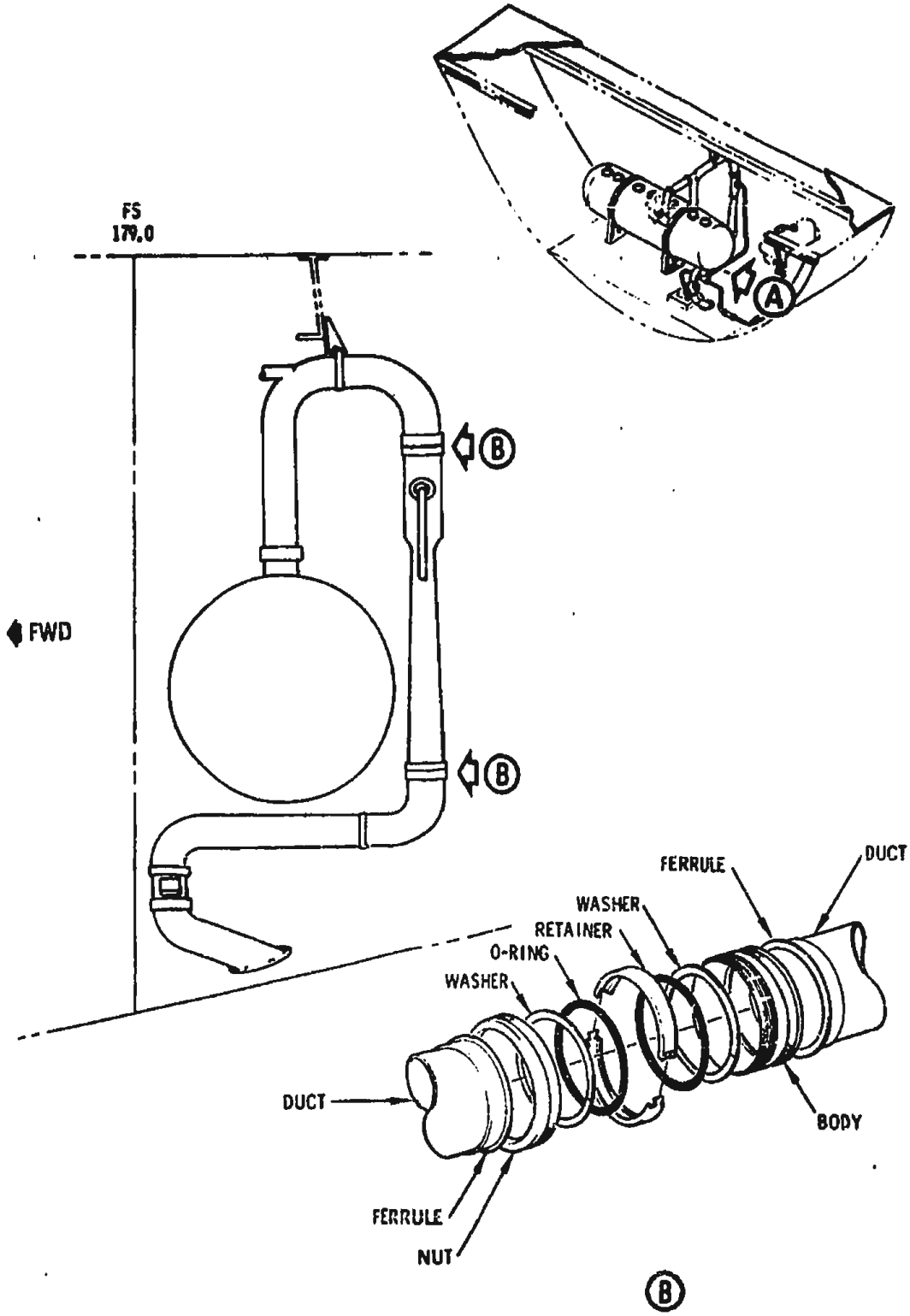
(a) On aft lavatory waste system service panel, connect a 45- to 50-psi air supply to the AIR connection.

(b) Note operation of exhaust air system in the aft lavatories to confirm jet pump operation.

(c) Disconnect air supply.

(8) Install cargo compartment liner panel removed in Step 4A(2).

(9) Remove tag and close circuit breaker opened in Step 4A(1), (2), (3) and (4).



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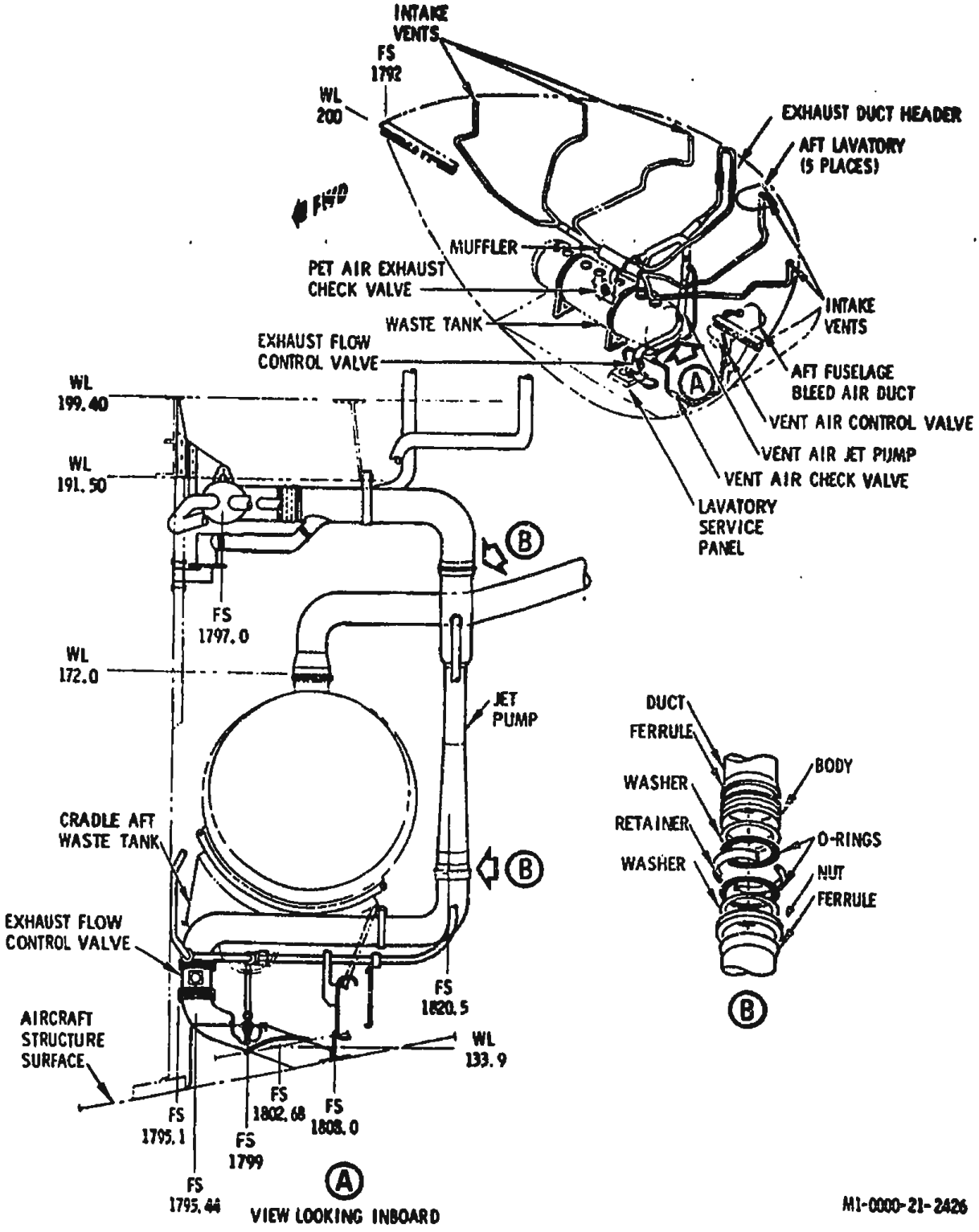
R Aft Lavatory Vent Air Jet Pump - Removal and Installation
R Figure 401



R Aft Lavatory Vent Air Jet Pump - Removal and Installation
R Figure 401

FORWARD LAVATORY EXHAUST FLOW CONTROL VALVE REMOVAL AND INSTALLATION

1. General

The forward lavatory exhaust system includes a vent air control valve, air check valve and jet pump exhaust flow control valve connected together in the forward electronic service center
R (FESC), zone 113. The air is drawn from the air cycle pack NO. 2 supply duct through a vent air control valve, air check valve, jet pump and discharged overboard through the exhaust flow control valve. Location and access to the forward lavatory exhaust flow control valve is in the FESC through access door 112AB.

2. Equipment and Materials

Protective caps

3. Referenced Procedure

20-36-01 Single T-bolt V-band Clamp - Removal and Installation

4. Removal/Installation

A. Removal

(1) Open access door 112AB.

(2) Remove support clamp on duct leading into flow control valve (Ref. Fig. 401).

(3) Remove single T-bolt V-band clamps (Ref. 20-36-01) which attach the flow control valve to the ducts and remove valve.

(4) Install protective caps on open ducts and valve.

B. Installation

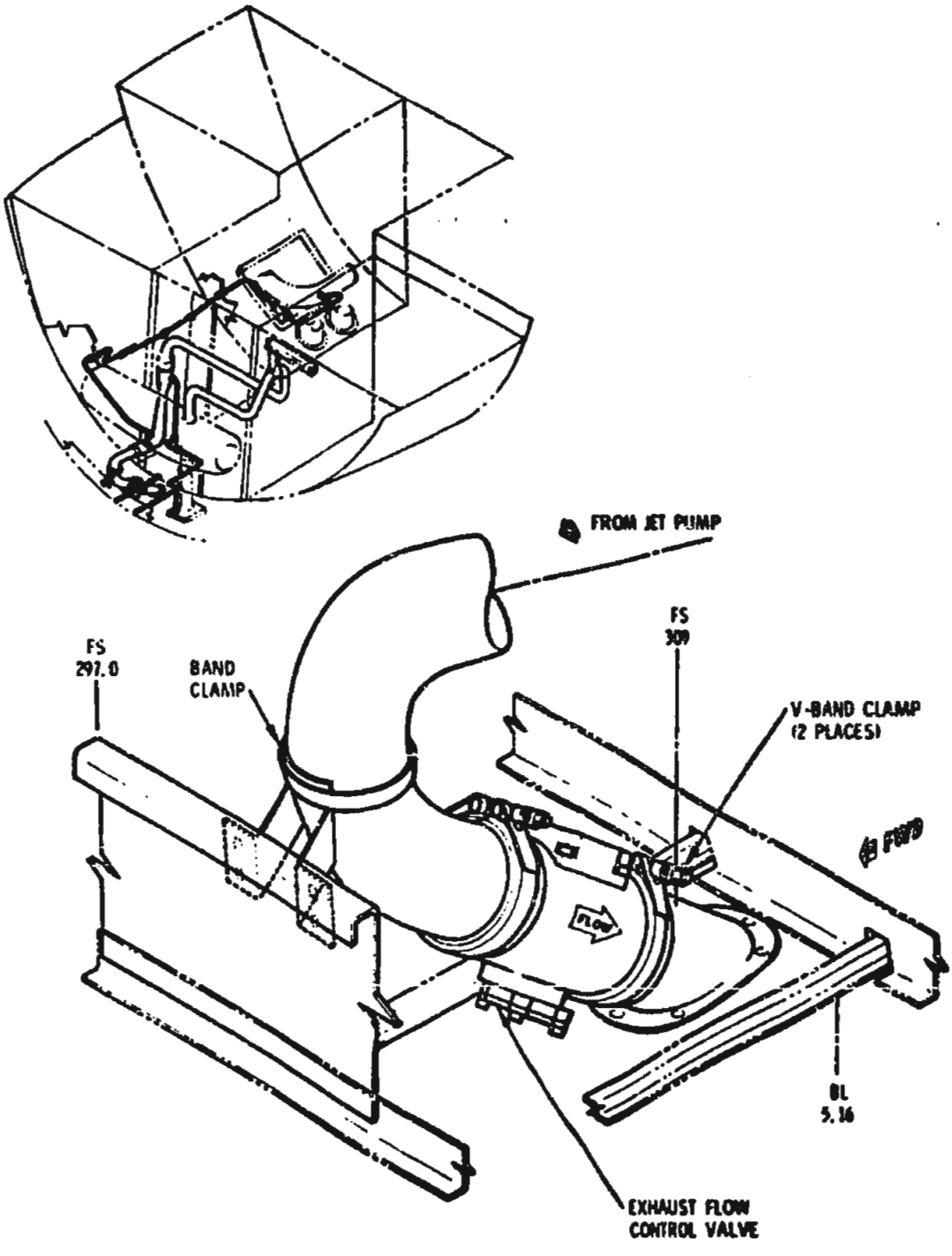
(1) Remove protective caps from exhaust ducts and valve.

(2) Position control valve with flow arrow pointing down and the position indicator in an easily-seen position. Install valve.

(3) Install single T-bolt V-band clamps removed in Step 4A(3).

(4) Install inlet duct support clamp removed in Step 4A(2).

(5) Close access door opened in Step 4A(1).



AM-0100-21-264

Forward Lavatory Exhaust Flow Control Valve
Removal and Installation
Figure 401

AFT LAVATORY EXHAUST FLOW CONTROL VALVE - REMOVAL AND INSTALLATION

R 1. General

R The aft lavatory exhaust system includes a vent air control valve, air check valve, jet pump, and exhaust flow control valve which are connected together in the aft cargo compartment zone 165. The air is drawn from the aft bleed air duct supply through a vent air control valve, air check valve, jet pump and discharged overboard through the exhaust flow control valve. Location and access to the aft lavatory exhaust flow control valve is in the aft cargo compartment through access liner panel 161BL.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

20-36-01	Single T-bolt V-band Clamp - Removal and Installation
25-51-06	Aft Cargo Compartment Liner - Removal and Installation

4. Removal/Installation

A. Removal

(1) On aircraft without SB53-172, remove aft cargo compartment liner panel 161BL (Ref. 25-51-06).

(1) On aircraft with SB53-172, remove aft cargo compartment Flow Control Valve Access Panel 161BL-1.

(2) Remove single T-bolt V-band clamps (Ref. 20-36-01) which attach the flow control valve to the ducts (Ref. Fig. 401) and remove the valve.

(3) Install protective caps on open ducts and valve.

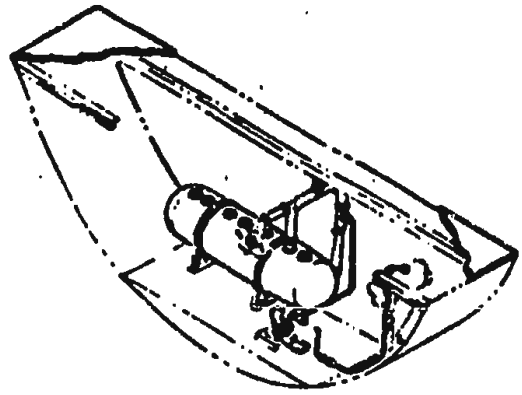
B. Installation

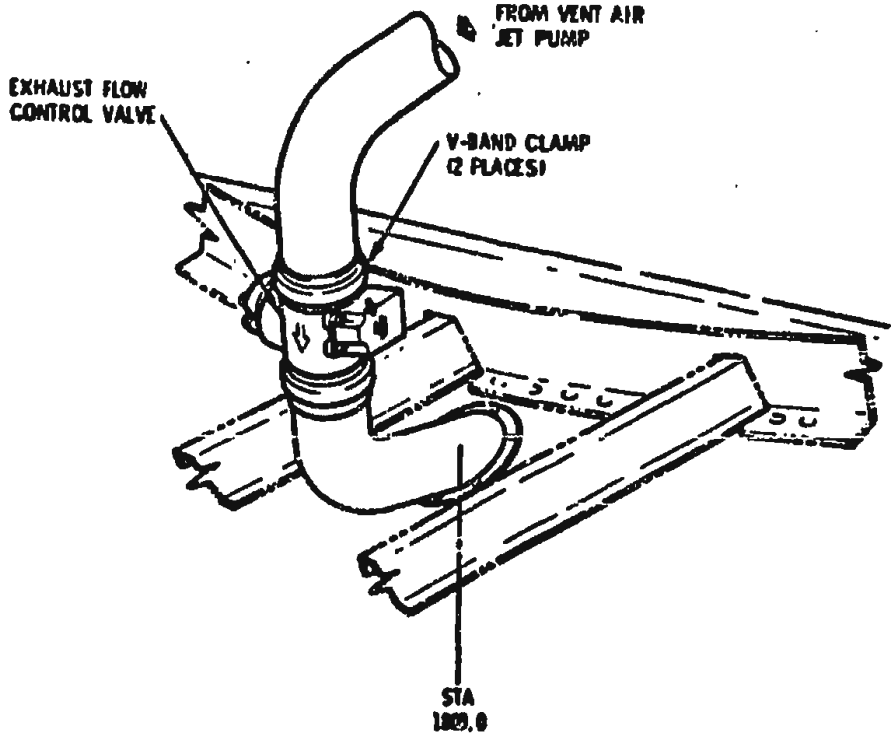
(1) Remove protective caps from exhaust ducts and valve.

(2) Position flow control valve with flow arrow pointing down and position and install valve.

(3) Install single T-bolt V-band clamps removed in Step 4A(2).

(4) Install compartment liner panel removed in Step 4A(1).





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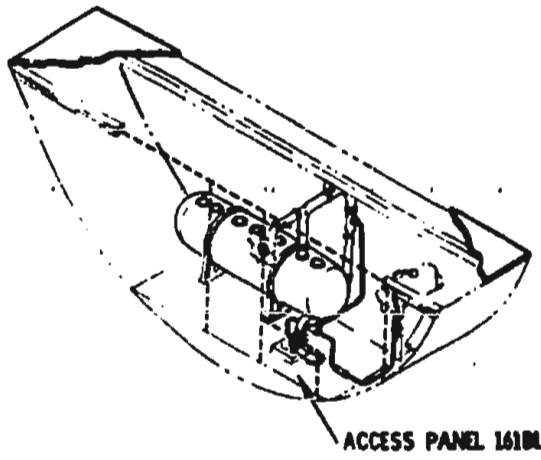
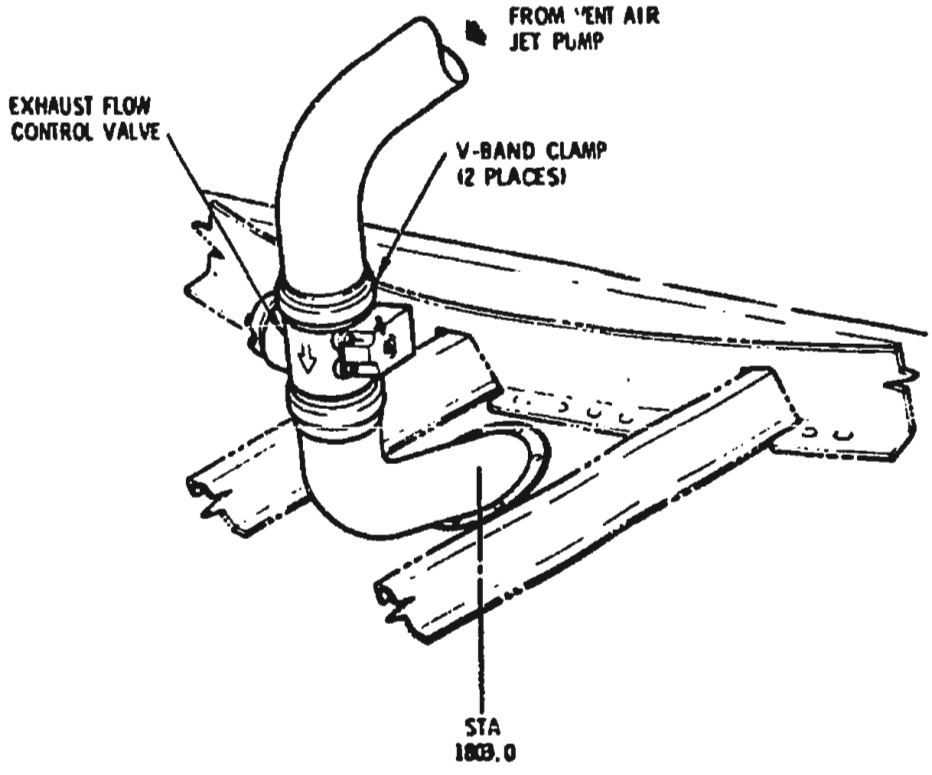
Aft Lavatory Exhaust Flow Control Valve - Removal and Installation
Figure 401





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Aft Lavatory Exhaust Flow Control Valve - Removal and Installation
Figure 401

JET PUMP CONTROL DIFFERENTIAL PRESSURE SWITCH REMOVAL AND INSTALLATION

1. General

The aircraft altitude is sensed by the cabin differential pressure switch through a static port located on the left side of the forward electronic service center (FESC). The combination of components for the lavatory vent air exhaust system are used only when cabin pressure is not available to provide the necessary air flow through the exhaust system. The cabin differential pressure sensing jet pump control switch controls both forward and aft lavatory vent air control valves, to activate the jet pumps when the cabin is not pressurized properly. Location and access to the cabin differential pressure switch in the FESC zone 113, is through access door 112AB.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

6-50-00 Interiors Access Doors and Panels

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215, open and tag circuit breaker LAV - JET PUMP (A4).

R (2) Open access door 112AB (Ref. 06-50-00).

NOTE: The jet pump control differential pressure switch is located on the former ring at the aft end of the center electronic rack, FS 219, outboard of the rack.

(3) Disconnect electrical connector from switch and install protective caps on plug and receptacle.

(4) Disconnect static line from switch and install protective caps.

(5) Remove nuts and screws holding switch to bracket and remove switch.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Position switch on mounting bracket and install screws and nuts.

(3) Remove protective caps and connect static line.

(4) Remove protective caps and connect electrical connector.

(5) Close access door opened in Step 4A(2).

(6) Remove tag and close circuit breaker opened in Step 4A(1).

R

LAVATORY VENT SCREEN - MAINTENANCE PRACTICES

CR 1. Forward Lavatory Vent Screen Cleaning/System Check

CR A. Open forward electronics service center door (112AB).

CR B. Remove forward lavatory vent screen (Ref. Fig. 201).

CR C. Clean paper/debris from vent screen.

CR D. Install vent screen.

CR E. Pressurize forward lavatory vent jet pump with either
CR aircraft pneumatic system or ground air source using adapter
CR Stk. Nbr. 72-2266.

CR F. Check forward lavatory overboard vent port and confirm good
CR air flow.

CR G. Shut off air source.

CR H. Close forward electronics service center door (112AB).

CR 2. Aft Lavatory Vent Screen Cleaning/System Check

CR A. Remove aft cargo compartment liner panel (161AL).

CR B. Remove aft lavatory vent screen and shim (Stk Nbr 19-4698)
CR (Ref. Fig. 202).

CR C. Clean paper/debris from vent screen.

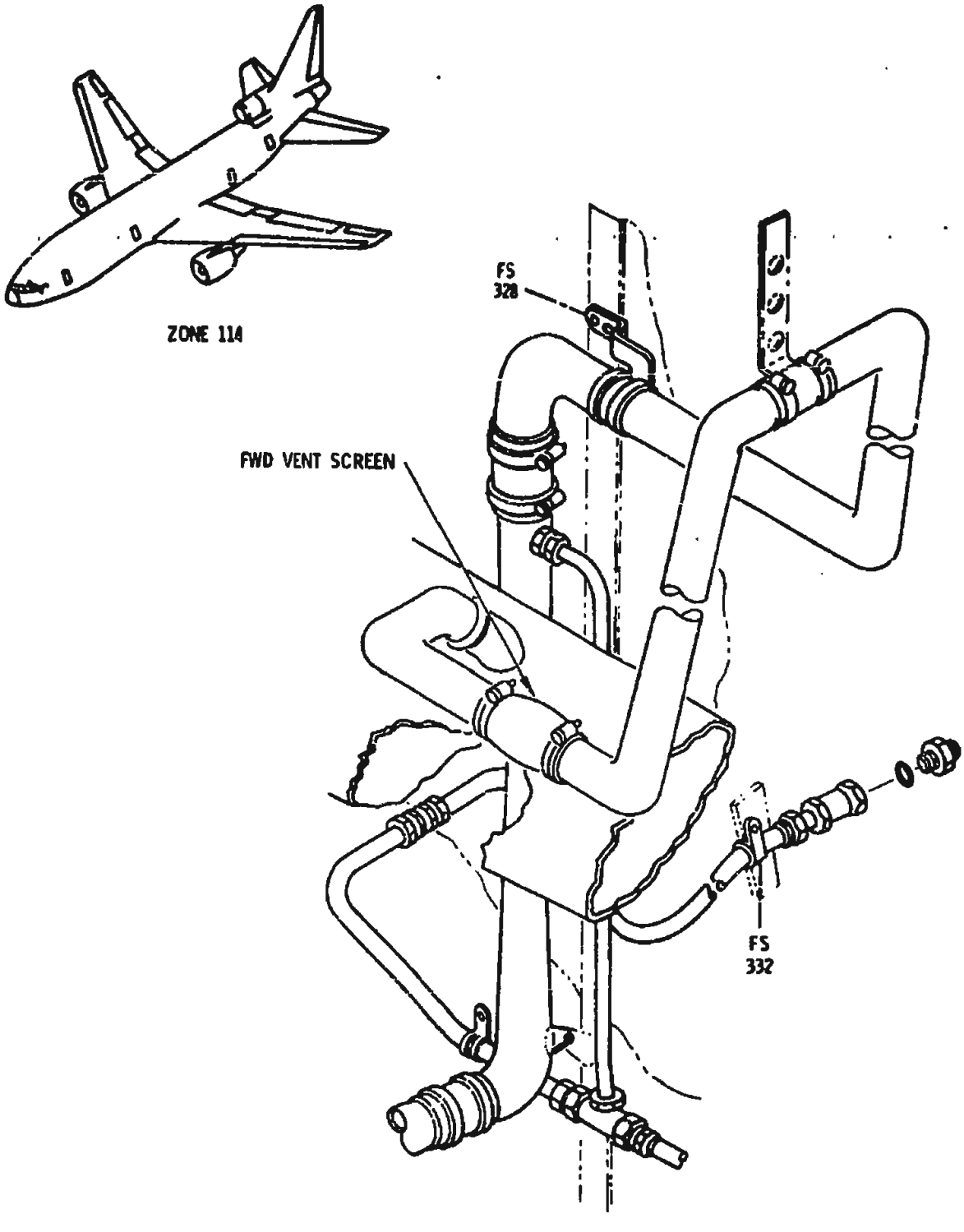
CR D. Install vent screen, and shim.

CR E. Pressurize aft lavatory jet pump with either aircraft
CR pneumatic system or ground air source using adapter (Stk Nbr
CR 72-2266).

CR F. Check aft lavatory overboard vent port and confirm good air
CR flow.

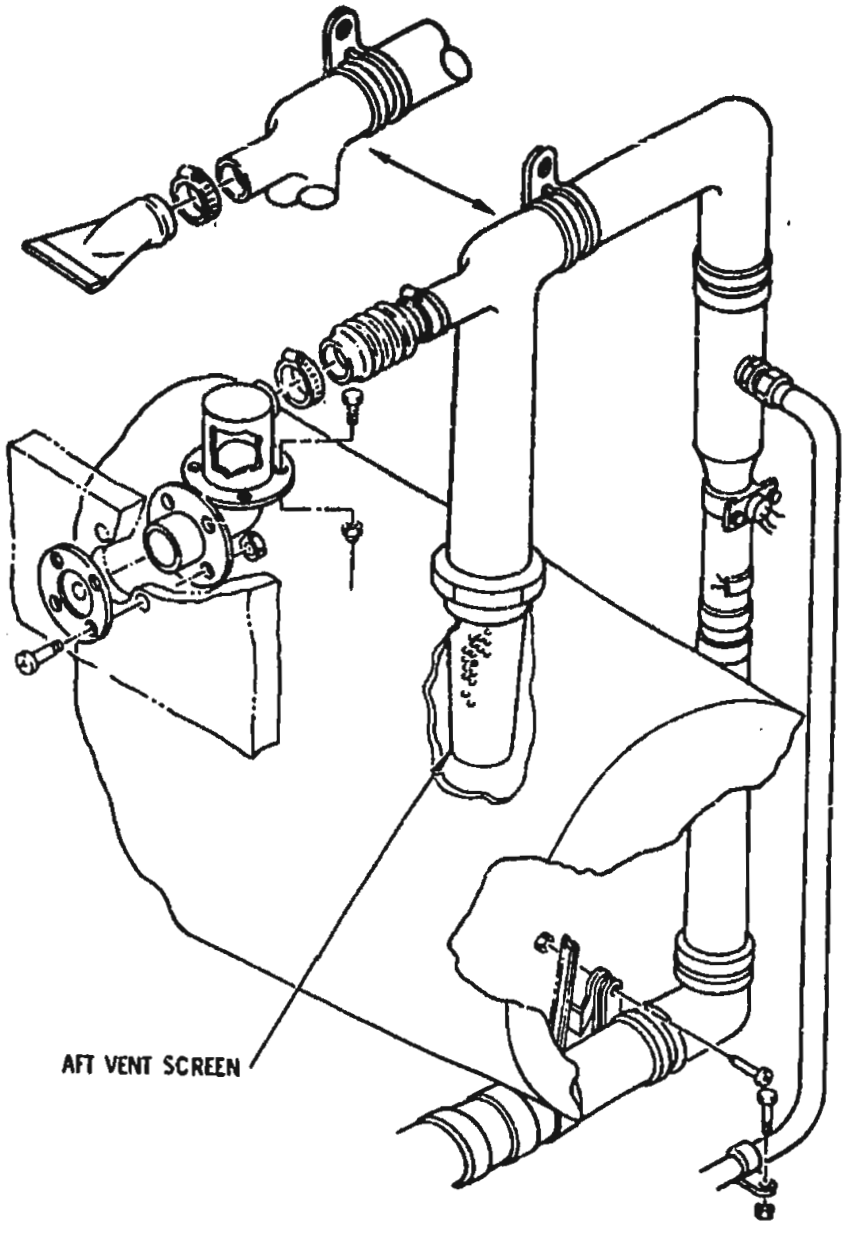
CR G. Shut off air source.

CR H. Install aft cargo compartment liner panel (161AL).



CR Vent Screen Installation, Fwd Lavatory
CR Figure 201

R EFFECTIVITY: ALL



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CR
CR

Vent Screen Installation, Aft Lavatory
Figure 202

R
R
001B

EFFECTIVITY: ALL

PRESSURIZATION CONTROL - DESCRIPTION AND OPERATION

1. General

R The following brief description of the pressurization control is
R intended for familiarization only. The engine bleed air system
R supplies pressure and temperature-controlled air for the
R pressurization and air conditioning system. Engine bleed air is
R supplied to the air pack through a series of high pressure
R valves and a pneumatic distribution manifold system. The air
R packs condition the air entering the cabin area. The
R conditioned air is also used for pressurization of the cabin
R area. The cabin pressure control system controls cabin pressure
R (altitude) and rate of pressure change by regulating the cabin
R exhaust air flow through two motor driven outflow valves located
R on the underside of the fuselage at the forward and mid cargo
R compartments. For detailed information on each of the
R sub-systems included, see cabin pressure control system (Ref.
R 21-31-00), safety relief system (Ref. 21-32-00) and indication
R and warning systems (Ref. 21-33-00).

R The following is a listing of optimum cabin pressures for
R passenger comfort: At the maximum differential pressure,
R between 8.44 to 8.59 psi, a sea-level cabin altitude can be
R maintained at 23,000 feet, or an 8,000-foot cabin altitude can
R be maintained at 42,000 feet. This pressure also coincides with
R normal pressure differential of 8.44 psi and maximum pressure
R differential of 8.59 psi.

R The pressurized areas of the fuselage extend from the forward
pressure bulkhead at FS 128 to the aft pressure bulkhead at FS
1804 to 1860. The following areas are not pressurized:

A. The nose landing gear wheel well and the air conditioning service center areas (FS 315 to 449).

B. The area below the wing center section (FS 983 to 1212). (The front spar and top of the wing center section carry cabin pressure loads).

C. The main landing gear wheel wells and the hydra[illegible] service center between them (FS 1212 to 1363).

The cabin pressure control system is a selective, automatic,
R electromechanical system. Major components include the cabin
R pressure control panel, the cabin pressure controller, and the
R two electrically operated cabin outflow valves (Ref. 21-31-00,
R Page 2 Description and Operation).

The cabin pressure control panel, located in the Flight Engineer/Second Officers upper panel, zone 215, includes all selectors, controls, and indicators for the system. Indicators showing cabin altitude, differential pressure, and rate-of-climb are located on the cabin pressure monitor panel above the pressure control panel.

The control panel selectors, controls, and indicators include:

Cabin altitude selection from -1,000 feet to +10,000 feet with barometric correction for existing takeoff and landing field conditions

Mode selector to select the inflight modes or ground checkout mode of operation

Normal and standby rate-of-change controls which operate with the mode selector

A system fault indicator which shows normal or standby system faults

Two outflow valve position indicators

Two selector/indicator switchlights and two control switches to select and manually control individual outflow valve positions.

Normal and standby selections from this panel, through the cabin pressure controller, use the ac actuator on each outflow valve to control cabin pressure. The isobaric and differential sections of the system automatically provide cabin altitude and rate-of-cabin pressure change as selected, and limit cabin
R differential pressure to a safe value.

R The manual outflow valve selectors and controls on this panel operate dc actuators on both outflow valves for manual override control of cabin pressure.

The outflow valves are rectangular twin-gate-type valves; the forward gate opens outward and the aft gate opens inward. The valves are mounted in the bottom of the fuselage (left of centerline) under the forward and mid cargo compartments, zones 124 and 154.

The safety relief system includes both positive and negative pressure relief valves. The two positive pressure cabin safety valves, mounted in the right cheek area outboard of the forward cargo compartment, zone 122, are completely independent, pneumatically operated units, which use cabin and atmospheric pressure references to limit the cabin differential pressure. In the event of multiple failures in the cabin pressure control

system, the valves operate to limit cabin differential pressure to a maximum of 8.70 to 8.80 psi. As each safety valve opens, a corresponding safety valve OPEN light on the cabin pressure monitoring panel comes on.

The two negative pressure relief valves, located in the upper portion of the aft pressure bulkhead, are simple flapper-type valves which open inward. The negative pressure relief valves prevent cabin pressure from becoming less than atmospheric during an extremely rapid descent. On the ground, these valves serve to allow cabin pressure to change with atmospheric pressure when all other openings in the fuselage are closed.

The cabin altitude warning system (Ref. 31-22-00) includes a pressure-operated switch that sounds a warning horn when cabin altitude exceeds 10,000 feet. The warning horn may be temporarily silenced by the horn cutout switch located at the top of the cabin pressure monitor panel. This circuit is automatically rearmed when cabin pressure is increased to an altitude below 10,000 feet.

On aircraft with Decompression Venting Modification, the passenger compartment area is provided with flow through decompression venting (Ref. 25-26-00) located along the sidewall just above the floor level on both sides of the airplane. Blowout panels are provided between galley and forward cargo, R mid cargo and aft cargo from cheek areas to cargo compartments. Also, pressure relief valves (Ref. 21-31-53) are provided in the cargo compartments.

These pressure relief valves serve the dual purpose of allowing pressurization of the cargo compartments and providing relief for the cargo compartment in the event of sudden decompression.

CABIN PRESSURE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

The cabin pressure control system regulates cabin pressure simply by releasing air pressure from the fuselage. The air cycle packs continually pump air into the cabin and raise the pressure inside (Ref. 21-51-00). Outflow valves located on the bottom of the fuselage open and close electromechanically to control the rate of pressure release (Ref. Fig. 1). The outflow valves are controlled by the cabin pressure controller. The controller determines the movement of the outflow valves using data from pressure ports built into the controller and output from the CABIN PRESSURE CONTROL panel, where the Flight Engineer/Second Officer (FE/SO) sets the cabin altitude (pressure) desired (Ref. Fig. 2). The control panel also provides a manual mode to control the valves directly without going through the controller.

2. Operation

The Cabin Pressure Control System is operated in one of four modes; the normal mode; the standby mode; the ground check mode; and the manual mode.

A. Normal Mode

R To operate in the normal mode, the FE/SO sets the MODE SEL
R switch on the CABIN PRESSURE CONTROL panel (Ref. Fig. 2) to
R NORM. The in-flight cabin altitude is then set by adjusting
R the ALT SET knob and observing the FLIGHT CAB calibration tape above the knob. The rate of cabin altitude change is then set using the NORM RATE knob.

After take-off the control system automatically controls the outflow valves so that cabin altitude increases at the rate selected by the NORM RATE knob until the cabin altitude set on the ALT SET knob is reached. It then maintains cabin
R altitude at this level to within 120 sea level feet. The
R controller maintains a nominal maximum cabin-to-ambient
R (inside-to-outside) pressure of 8.44 psi. The controller will not, however, allow the cabin-to-ambient
R (inside-to-outside) pressure to exceed 8.59 psi maximum
R limit, but will instead override the settings of the NORM RATE AND ALT SET knobs. This is to prevent pressure stresses on the fuselage beyond design limits.

During preparation for descent, the FE/SO sets the landing field altitude with the ALT SET knob, the landing field

R barometric pressure with the the BARO SET knob and the rate of cabin altitude descent with the NORM RATE knob so that cabin pressure and ambient pressure will equalize before touchdown. Cabin altitude then decreases at the rate and to the altitude selected. Again, the controller does not allow
R cabin-to-ambient differential pressure to exceed 8.44 psi
R nominal.

B. Standby Mode

The standby mode is most often used when the normal mode fails. To operate in the standby mode the FE/SO sets the MODE SELect switch to STBY and selects the rate of pressure increase or decrease desired on the STBY RATE knob. Since there is no direct indication of the rate of altitude change on the knob, the FE/SO must monitor the CABIN CLIMB and CABIN ALT indicators while making adjustments. When the cabin altitude reaches the desired level, the FE/SO turns the STBY RATE knob to HOLD and the cabin altitude approximately holds.

In standby mode cabin-to-ambient pressure is not automatically limited to 8.4 psi as in the normal mode. The only protection, then, against high differential pressures are the cabin safety relief valves (Ref. 21-32-00). These valves open to limit differential pressure to around 8.8 psi.

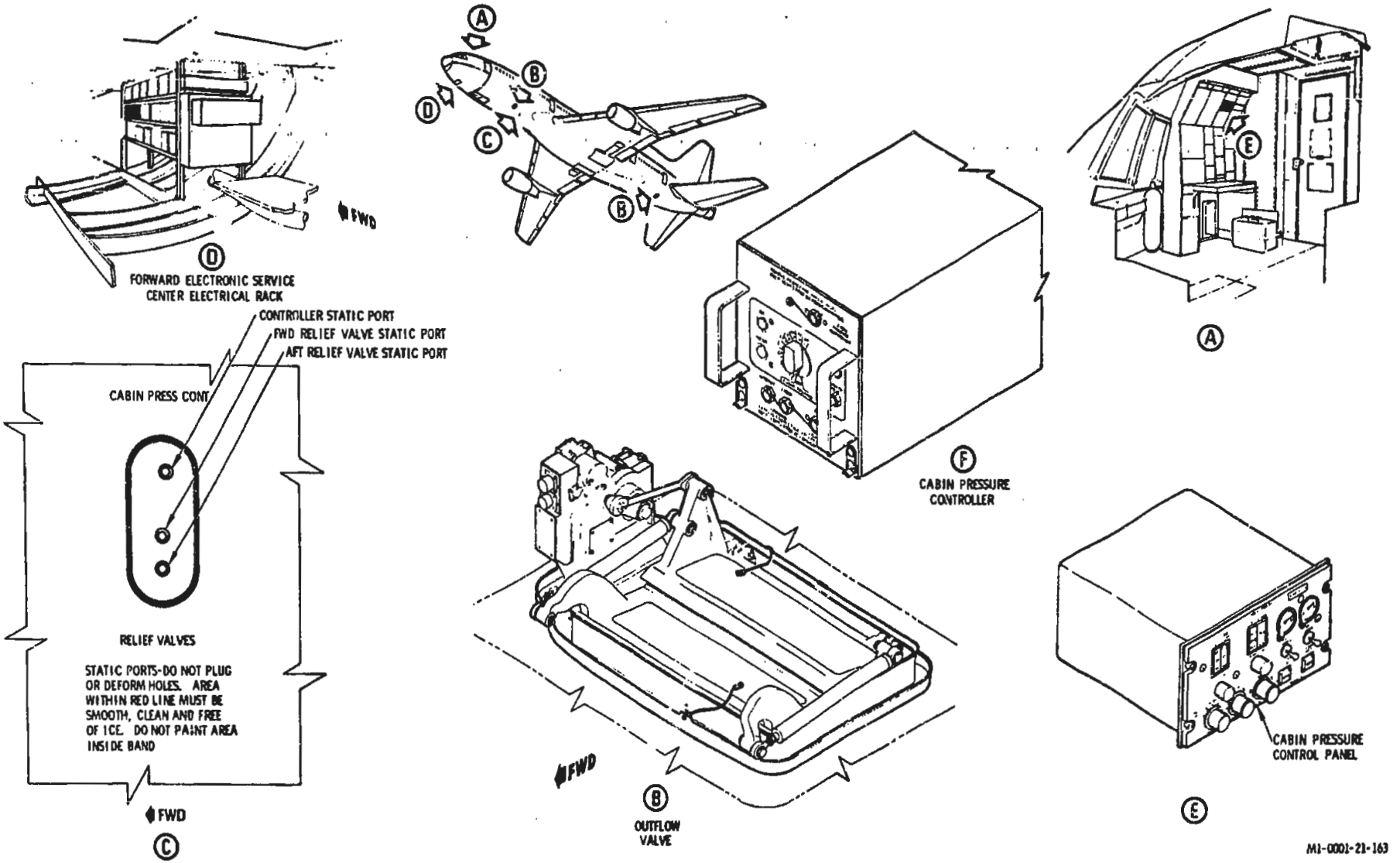
C. Ground-Check Mode

The ground check mode is used by maintenance personnel to override an air ground sense relay that causes the outflow valve to move to full open position when the airplane is on the ground. In the ground check mode the system acts as if in the normal mode and in the air. The normal mode operation can then be checked on the ground.

D. Manual Mode

The manual mode is used either to test the outflow valve operation or when both the normal and standby modes fail to operate properly. Since in the manual mode the outflow valve is moved by a DC motor rather than AC, the normal mode can be used when AC power fails.

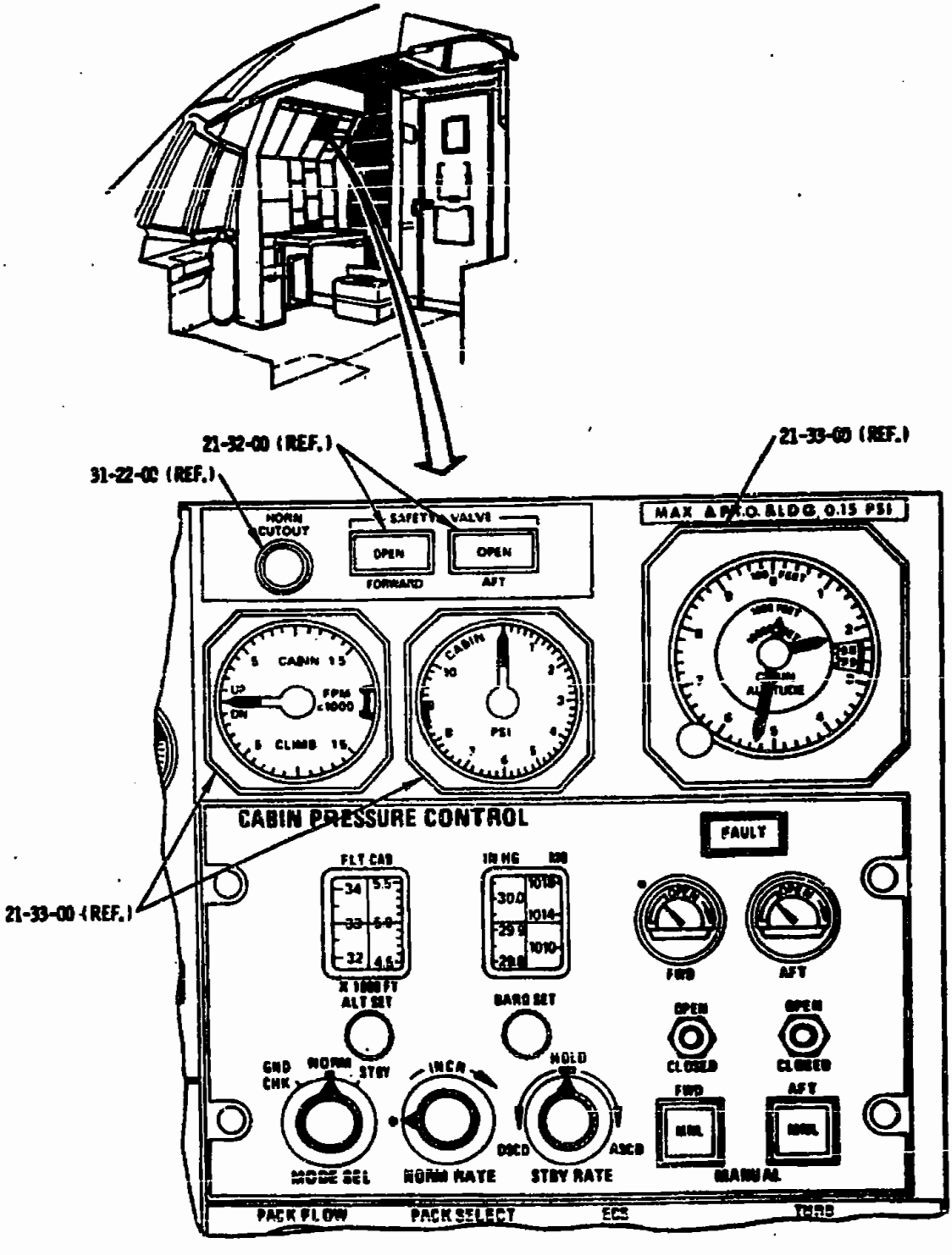
To put an outflow valve in the manual mode the corresponding MNL switchlight is depressed. Either one or both outflow valves may be operated in the manual mode at the same time. If one is not in manual mode it continues to operate independently in the mode indicated on the MODE SEL switch.



CR Cabin Pressure Control System Components
CR Figure 1

EFFECTIVITY: ALL

001B



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Cabin Pressure Control Panel
Figure 2

EFFECTIVITY: ALL

001B

To move a valve more opened or closed the toggle switch above the MNL switchlights is moved to the OPEN or CLOSE position until the valve position indicator above the switch indicates the desired valve position. When operating in the manual mode the CABIN CLIMB and CABIN ALT indicators should be constantly monitored.

3. CABIN PRESSURE CONTROL Panel (Ref. Fig. 2)

The CABIN PRESSURE CONTROL panel (Ref. Fig. 2) has all the selectors, control knobs, switches and indicators needed to control the pressure control system. This panel is mounted on the FE/SO console, (zone 215) (Ref. Fig. 2). Following is a brief description of the various components on the control panel and their function within the system:

A. FLT CAB - ALT SET Indicator and Control Knob

R The ALT SET knob is a potentiometer mechanically coupled to the FLighT CAB calibration tape. It should be noted that the calibration tape is merely a mechanical indication of ALT SET knob position and not an electronic indication of the actual signal being sent. Selection range is from minus 1,000 feet to plus 10,000 feet.

The ALT SET potentiometer connects directly with the controller and sends a signal which the controller interprets into a cabin altitude limit in the normal mode (Ref. Fig. 3). A description of how the controller interprets the ALT SET signal is given in Part 4, Cabin Pressure Controller.

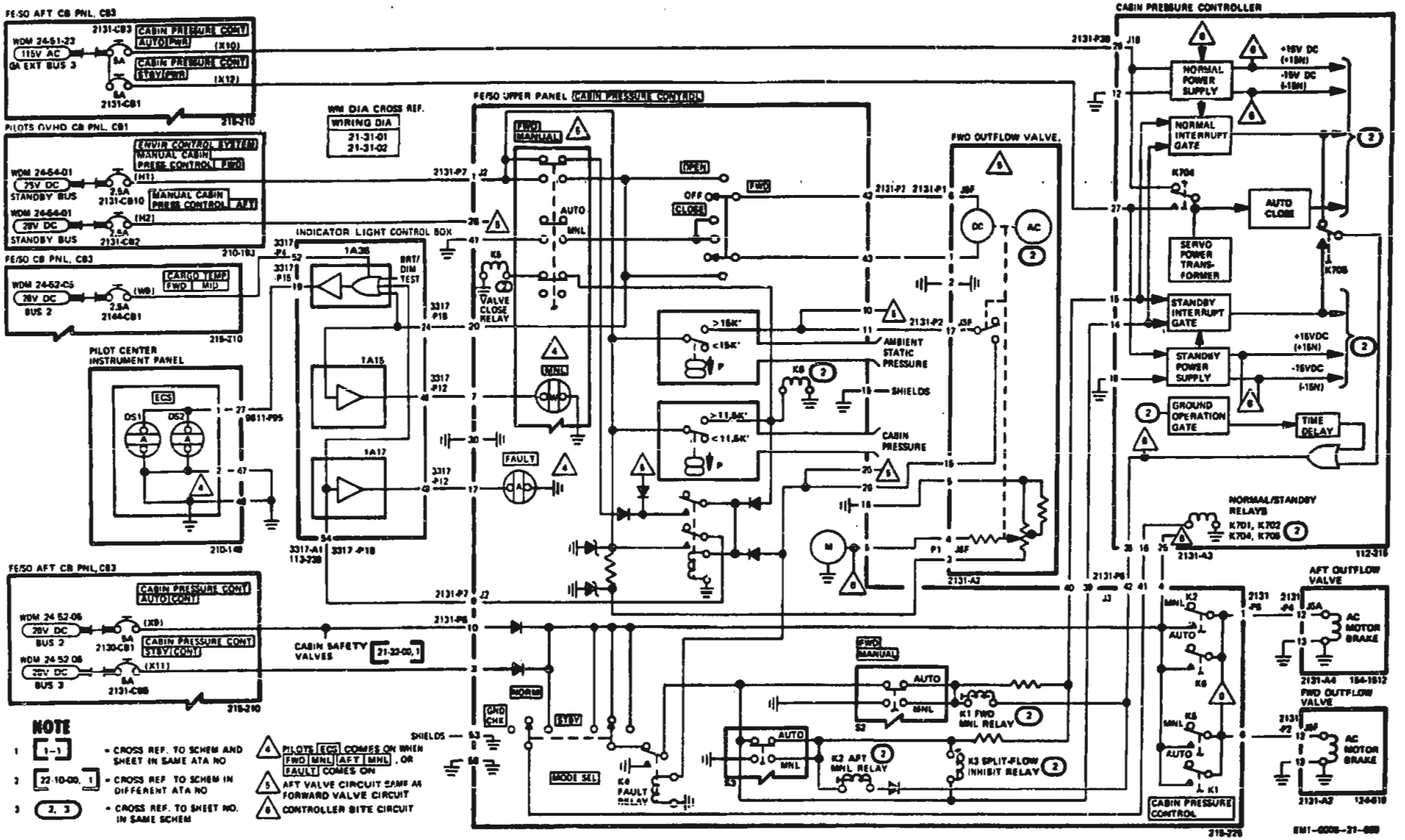
B. BARO SET - Indicator and Control Knob

The BARO SET is a potentiometer mechanically coupled with the calibration tape indicator above it. Selection range is from 948 to 1050 millibars.

The BARO SET potentiometer is connected directly with the controller to send a signal which the controller interprets as a correction added to the altitude limit (Ref. Fig. 3). A description of how the controller interprets the BARO SET signal is given in Paragraph 4, Cabin Pressure Controller.

C. MODE Selector Switch

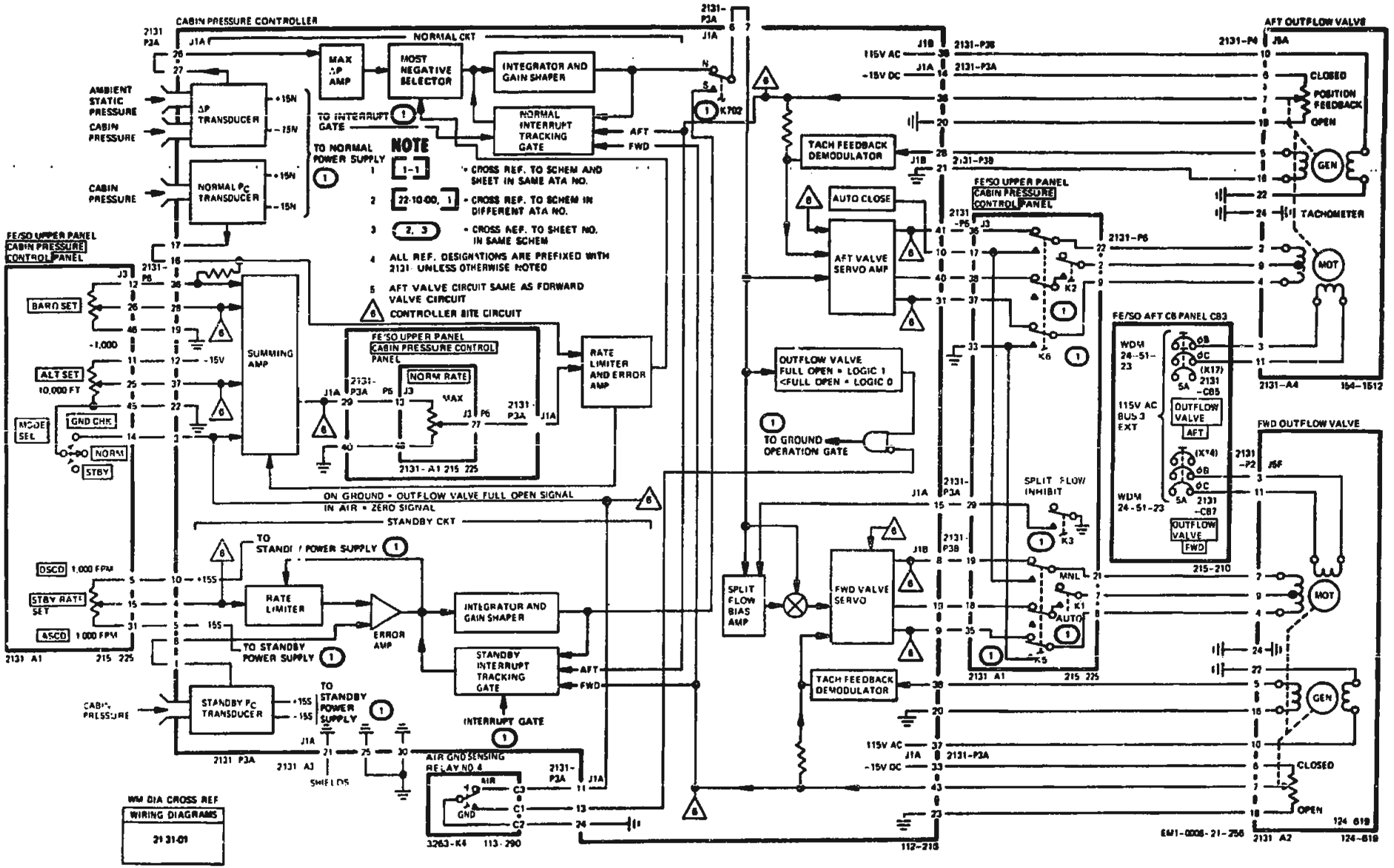
The MODE selector switch connects and disconnects the various circuits for the ground check, normal, and standby modes. In the GND CHK position the switch grounds the signal from the air/ground sensing relay to simulate the normal mode when in flight. Otherwise, normal mode and



Cabin Pressure Control Schematic
Figure 3 (Sheet 1)

EFFECTIVITY: ALL

0018



Cabin Pressure Control Schematic
Figure 3 (Sheet 2)

EFFECTIVITY: ALL

0018

ground check position are electronically the same. In the standby mode 28VDC is supplied through the MODE SELector switch to four relay coils which switches controller circuits from normal to standby mode. To understand MODE SEL circuitry refer to the Cabin Pressure Control Schematic (Ref. Fig. 3), and Paragraph 4, the Cabin Pressure Controller.

D. NORMAL RATE Control Knob

The NORMAL RATE Control knob is a potentiometer which connects directly with the controller. It sends the controller a signal to limit cabin altitude change to a selected rate. The controller compares the signal with a
R signal from the Normal Cabin Pressure Transducer and if the two signals differ, a signal is sent to the outflow valves to compensate for the difference. There is no direct indication of the rate of cabin altitude change marked on the knob. The index mark, however, indicates standard operation rates of 300 sea level feet per minute (slfm) for decreasing cabin altitude and 500 slfpm for increasing cabin altitude. Selection range is from 100 to 900 slfpm for decreasing cabin altitude and 200 to 1500 slfpm for increasing cabin altitude.

For a more complete description of the function of the NORM RATE signal refer to Paragraph 4, Cabin Pressure Control (Ref. Fig. 3).

E. STANDBY RATE Control Knob

The STBY RATE control knob is a potentiometer which connects directly with the controller. It provides the controller with a signal to limit the rate of cabin altitude change in the standby mode. Its range is from 0-1000 slfpm in either direction.

The signal from the STBY RATE potentiometer is compared with
R a signal from the Standby Cabin Pressure Transducer. If the signals do not compare, a signal is generated to move the outflow valves to compensate (Ref. Fig. 3). For a more complete description of the function of the STBY RATE signal refer to Part 4, Cabin Pressure Controller.

F. FAULT Light

The FAULT light comes on when either of two conditions exist: the Oxygen Avoidance System is activated (Ref. Paragraph G) or the aircraft is above 15,000 feet and outflow valve is opened beyond the green band on the valve position indicator (Ref. Paragraph H).

G. Oxygen Avoidance System

When cabin altitude reaches 13,300 feet passenger oxygen masks deploy (Ref. 35-21-00). It is expensive to replace oxygen generators after this occurs. Every effort is made, therefore, by the system to avoid oxygen deployment.

The oxygen avoidance system activates at 11,500 feet when the cabin pressure switch in the control panel closes. This provides 28VDC power to the coils of two relays which close to turn on the FAULT light and to produce a signal to close the outflow valves until cabin altitude drops below 11,000 feet. The system will continue to cycle if cabin altitude again rises (Ref. Fig. 3).

H. Outflow Valve Beyond Normal Range Above 15,000 Feet Fault System

Above 15,000 feet flight altitude, the normal or standby system should not allow the outflow valves to open beyond five and one quarter degrees (5 1/4°) as indicated by the green band on the valve position indicator. But if this occurs, circuits provided in the CABIN PRESSURE CONTROL panel switch off power to AC motors in both the outflow valves. The outflow valves must then be positioned back
R into the green band using the manual mode. Reselection of
R the original mode may then be made.

The system detects flight altitude through an ambient static pressure switch that closes at 15,000 feet. The switch is located in the control panel and is connected to a sensing line from the pitot-static system (Ref. 34-13-00). Valve position is determined through the signal from the valve position indicator potentiometer in the outflow valve.

I. FWD and AFT Outflow Valve Position Indicators

The outflow valve position indicators show how much the valve gates are opened and the green bands indicate normal flight opening range. The indicators are connected to potentiometers in the outflow valves which change with valve position. -15VDC is placed across the resistor in the potentiometer and when the variable tap moves across it, it provides a voltage proportional to valve position (Ref. Fig. 3).

J. MANUAL - FWD and AFT Switchlights

R Latching the MANUAL switchlights deactivate all other modes and switch on manual mode circuits. The switchlights can be
R operated separately to put one or both valves in the manual

R mode. When the system is in the manual mode the switchlight comes on.

K. OPEN - CLOSE Switches

The two OPEN - CLOSE switches are used to control valve position when MNL switchlight is on. The switches have three positions. The OFF position completely disconnects the outflow valve (Ref. Fig. 3).

In the OPEN position, 28VDC power is supplied to the outflow valve DC motor to open up the valve.

In the CLOSE position 28VDC power is reversed in polarity to close down the outflow valve (Ref. Fig. 3).

4. Cabin Pressure Controller

The cabin pressure controller is the "brain" of the cabin pressure control system. It acts as an interface between the CABIN PRESSURE CONTROL panel and the outflow valves. It is located in the electronic service center, zone 113 (Ref. Fig. 1).

The cabin pressure controller has self contained, built in test equipment (BITE).

The internal circuitry of the controller is complicated and only a very general description of its internal functions is given here.

A. Normal Mode

In the normal mode the signals from the BARO SET and ALT SET potentiometers from the control panel are combined in a summing amp to produce a corrected signal. This signal is compared with the signal from the normal cabin pressure transducer and a constant voltage signal is outputed if the signals are different. The polarity of the signal is determined by whether the cabin altitude (as indicated by the transducer) is greater or less than the combined settings of the BARO SET and ALT SET potentiometers. The signal is then applied across the NORM RATE potentiometer and the tap output is inputed into the rate limiter and error amp. This inputed voltage is proportional to the rate set on the NORM RATE potentiometer.

The rate limiter and error amp compares this signal with a signal from the Normal Cabin pressure transducer. If the actual rate of cabin altitude change is different than the rate set by the NORM RATE potentiometer, then an appropriate

signal is generated to correct for the difference. The signal is then input into a switching device. This device also receives input from the differential pressure transducer. The differential pressure transducer has two sensing ports; one which senses cabin pressure directly; and another which senses ambient static pressure through a sensing line leading to static ports in the side of fuselage (Ref. Fig. 1). If the differential pressure transducer detects a cabin-to-ambient differential pressure greater than 8.44 psi then the switching device switches control of the system to the transducer. The transducer signal then controls the system until differential pressure is below 8.59 psi maximum. Otherwise, the system is controlled by the rate limiter and error amp output (Ref. Fig. 3).

The switching device outputs the signal to an integrator and gain shaper which converts the signal to a form which can control the valves. The signal then passes through the normal/standby relays. These relays and the normal and standby interrupt gates determine what mode circuitry the outflow valves are controlled from. The signal then goes to the valve servo amps which combine the feedback signals from the valves to control valve movement (Ref. Fig. 3).

B. Ground Check Mode

The ground check mode uses all the same circuits as the normal mode. The only difference is that in the ground check mode the input to the summing amp from the air/ground sensing relay is grounded, as it would be in flight. When this input is not grounded the summing amp puts out a signal which the system interprets to force the outflow valves full open. The ground check mode merely overrides this function (Ref. Fig. 3) and simulates an in flight condition.

R

C. Standby Mode

The standby mode operates similar to the normal mode but does not have circuitry to limit differential pressure or cabin altitude. When the MODE SEL switch is set to STBY, relays are actuated to connect the outflow valve servo amplifiers with the standby control circuitry (Ref. Fig. 3).

The rate limiter and error amp compare the change in the cabin standby cabin pressure transducer signal to the signal from the standby rate potentiometer. The resulting signal is then processed through an integrator and gain shaper and is then directed through the relays and standby interrupt gate to the forward and aft outflow valves servo amplifers. The servo amps control valve movement using feedback signals (Ref. Fig. 3).

D. Manual Mode

Manual mode circuits do not go through the controller. They deactivate normal, standby and ground check circuits by disconnecting the AC outflow valve actuators directly and disconnecting AC motor brakes (Ref. Fig. 3). Refer to CABIN PRESSURE CONTROL panel, Part 3 for description of system.

E. BITE Sequencing and Indicating Circuits

The BITE circuits are used to determine the operational capability of all of the line replaceable units in the system. To operate the BITE, a selector switch on the front face of the controller is set at selected positions. Two go/no-go indicator lights provide information as to the condition of the selected unit. The BITE system is isolated from the normal control circuits by an OFF position of the test selector switch.

5. Cabin Outflow Valve

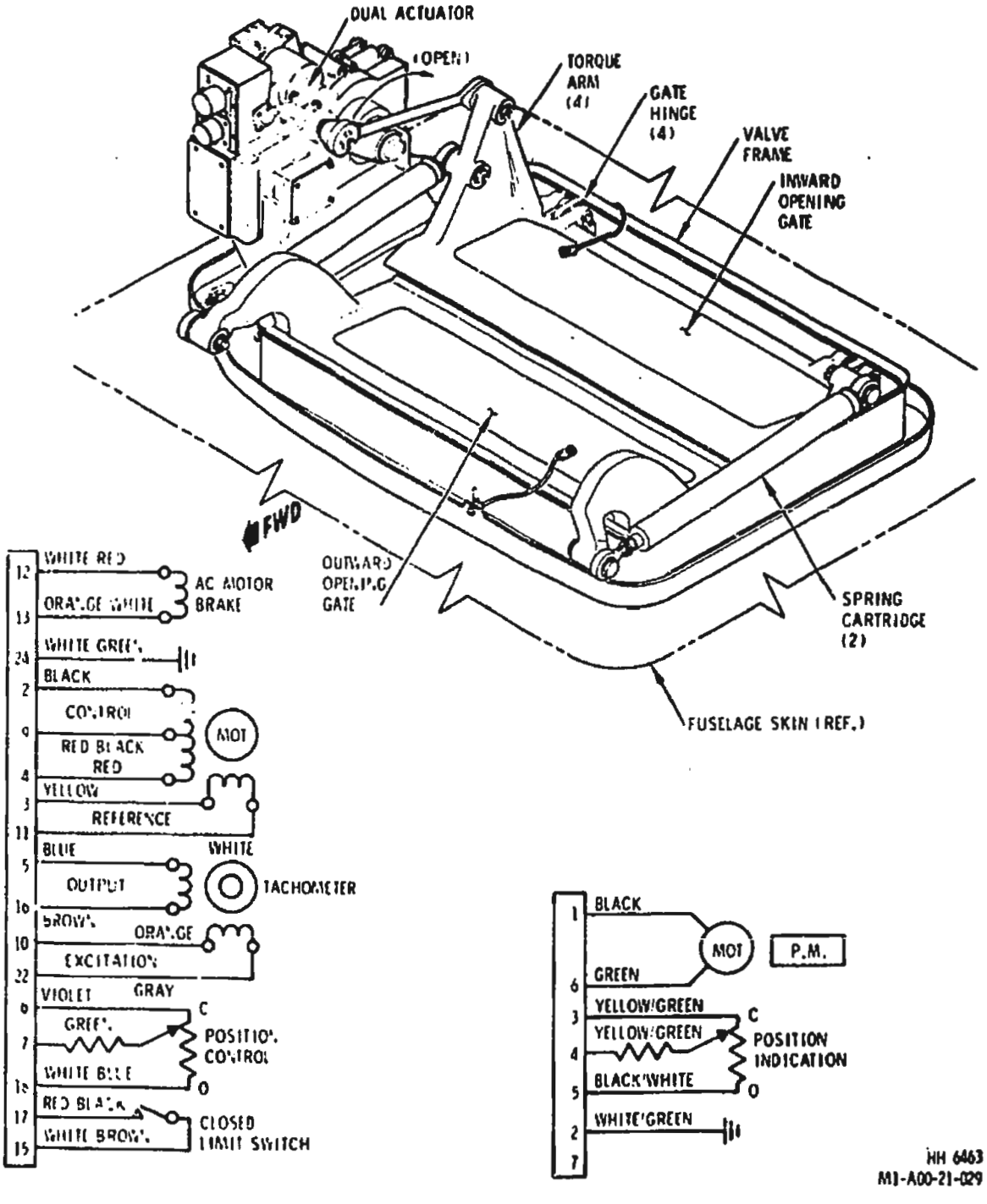
The cabin outflow valve (Ref. Fig. 4) is a rectangular frame carrying inward and outward opening valve gates, dual actuator motors (ac and dc) with a common gear train, linkage from the actuator to the aft (inward opening) valve gate, and with a spring cartridge parallel linkage connecting the two valve gates.

The dual actuator assembly contains an ac actuator with a dc operated brake, a tachometer, two position potentiometers, and gear trains connecting both actuators to the output shaft.

When the ac actuator is being used, the dc operated brake is energized and released. The gearing in the dc actuator gear train prevents movement of that actuator. When the dc actuator is in use, the dc brake on the ac actuator is deenergized, locking the ac actuator.

One position potentiometer and the tachometer are used in the normal and standby modes providing feedback to control valve position and actuator speed. Another position potentiometer is used for the valve position indicator. These three units are on the actuator output shaft.

The ac motor and gearing can move valve gates at a maximum rate of twelve degrees per second to meet system response requirements at takeoff; a minimum six degrees per second at a load of 350 inch pounds to handle inflow transients while pressurized; and a breakaway torque of 500 inch pounds for ice breaking and valve opening capability with burst supply duct flow.



Cabin Outflow Valve
Figure 4

The dc motor and gearing produce a breakaway torque of 500 inch pounds; and move gates at a maximum rate of four degrees per second and a minimum rate of two degrees per second at a load of 350 inch pounds.

During pressurized flight the required outflow area is small and the lips of the two gates are close together, forming a thrust recovery nozzle. Aerodynamic torque forces the gates closed, to provide a fail safe feature in event of actuator linkage failure. The spring cartridge linkage, between the valve gates, allows moderate inward positioning of the forward (outward opening) gate by ram pressure during high speed low altitude flight, to reduce drag and suction effects at the valve.

CABIN PRESSURE CONTROL SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting cabin pressure control system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft
R flight log book and reported to maintenance personnel by a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the entry point containing the fault isolation procedure. When no block number is specified, the entry point is block 1.

Prerequisites listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the cabin pressure control system. It gives the access/area of each component and its respective removal and installation reference.

Figure 102, Component Location Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed discussion of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Supplemental data

Supplementary data includes functional tests, checkout tests, BITE checks and other general information that can be helpful in
R performing fault isolation.

3. Fault Isolation/Identification

Table 101 is a list of fault isolation data in this section of the manual.

Table 102 lists all doors and access panels that must be closed to pressuize the cabin. Figure 103 is to be used when the FAULT
R light is on. Figures 104, 105, 106, 107 and 108 are to be used for any other cabin pressure problem.

TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
103	FWD and/or AFT Outflow Valve Check
104	Cabin Pressure Fault Light on
105	Unable to Maintain Cabin Pressure at High Altitude with Normal Pack Operation
106	Cabin Pressure MANUAL Control Problems
107	Takeoff and Touchdown Problems
R 108	Outflow Valves Oscillation Problems

R Doors and Access Panels
Table 102

DOOR NO.	NAME	QUANTITY
	DOORS	
	Flight Compartment Hatch	1
L1 thru L3 and R1 thru R3	Passenger Doors	6
L4 and R4	Emergency Doors	2
112AB	Forward Electronic Service Center Door	1
C1	Forward Cargo Door	1
G1	Galley Door	1
137AZ	Mid Electrical Service Center Door	1
C2	Center Cargo Door	1
R C3	Aft Cargo Door	1
	ACCESS PANELS	
111BZ	Left Radome to Flight Station	1
111CZ	Right Radome to Flight Station	1
113CZ	Canted Bulkhead to No. 1 Heat Exchanger Check Valve	1
113DZ	Canted Bulkhead to No. 2 Heat Exchanger Check Valve	1
113EZ	Canted Bulkhead to No. 3 Heat Exchanger Check Valve	1

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR – OUTFLOW VALVE	1	UNDER FWD CARGO FLOOR; 124LT	21-31-52
ACTUATOR – OUTFLOW VALVE	1	UNDER MID CARGO FLOOR; 154KT	21-31-52
BLOWOUT PANELS:			
BULKHEAD	5	FWD CARGO COMPT AFT BULKHEAD, FS 703; 120	25-51-14
BULKHEAD	5	CENTER CARGO COMPT AFT BULKHEAD, FS 1625; 150	25-51-14
BULKHEAD	3	AFT CARGO COMPT AFT BULKHEAD, FS 1792; 160	25-51-14
SIDEWALL LINER	8	FWD CARGO COMPT LEFT SIDEWALL, FS 449 – FS 703; 123	25-51-13
SIDEWALL LINER	6	FWD CARGO COMPT RIGHT SIDEWALL, FS 449 – FS 703; 122	25-51-13
SIDEWALL LINER	7	CENTER CARGO COMPT, LEFT SIDEWALL, FS 1371 – FS 1625; 153	25-51-13
SIDEWALL LINER	6	CENTER CARGO COMPT, RIGHT SIDEWALL, FS 1371 – FS 1625; 152	25-51-13
SIDEWALL LINER	5	AFT CARGO COMPT, LEFT SIDEWALL, FS 1625 – FS 1792; 163	25-51-13
SIDEWALL LINER	5	AFT CARGO COMPT, RIGHT SIDEWALL, FS 1625 – FS 1792; 162	25-51-13
CIRCUIT BREAKERS:			
ANN RESET 3317-CB12	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (L9); 210	*
CABIN PRESSURE CONT – AUTO CONT 2130-CB1	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X9); 215	*
CABIN PRESSURE CONT – AUTO POWER 2131-CB3	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X10); 215	*
CABIN PRESSURE CONT – STBY CONT 2131-CB8	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X11); 215	*
CABIN PRESSURE CONT – STBY POWER 2131-CB1	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X12); 215	*

*SEE WM EQUIPMENT LIST

M1-0000-21-1329

R
R
R Component Location Index
Figure 101
(Sheet 1)

EFFECTIVITY: ALL

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COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
CARGO TEMP – FWD – MID 2144-CB1	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (W9); 215	•
ENVIR CONTROL SYSTEM MANUAL CABIN PRESS CONTROL – AFT 2131-CB2	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (H2); 210	•
ENVIR CONTROL SYSTEM MANUAL – FWD. 2131-CB10	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (H1); 210	•
OUTFLOW VALVE – AFT 2131-CB5	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X17); 215	•
OUTFLOW VALVE – FWD 2131-CB7	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (X14); 215	•
CONTROL BOX – INDICATOR LIGHTS ILCB CARDS			
1A15	1	FESC, INDICATOR LIGHTS CONTROL BOX; 112AB, 211CB	33-17-04
1A17	1	FESC, INDICATOR LIGHTS CONTROL BOX; 112AB, 211CB	33-17-04
1A36	1	FESC, INDICATOR LIGHTS CONTROL BOX; 112AB, 211CB	33-17-04
CONTROLLER – CABIN PRESSURE	1	FESC, RIGHT ELECTRICAL RACK; 112AB, 211CB	•
DOOR SEALS:			
CARGO COMPARTMENT DOORS			
AFT CARGO (C-3)	1	LOWER HALF OF FUSELAGE, RIGHT, FS 1701; 824	52-31-05
CENTER CARGO (C-2)	1	LOWER HALF OF FUSELAGE, RIGHT, FS 1508; 823	52-31-05
FORWARD CARGO (C-1)	1	LOWER HALF OF FUSELAGE, RIGHT, FS 666; 821	52-31-05
EMERGENCY EXIT DOOR (L4)	1	UPPER HALF OF FUSELAGE, LEFT, FS 1778; 835	52-21-52
EMERGENCY EXIT DOOR (R4)	1	UPPER HALF OF FUSELAGE, RIGHT, FS 1778; 835	52-21-52
FLIGHT COMPARTMENT EMERGENCY HATCH	1	UPPER HALF OF FUSELAGE, LEFT, FS 218; 831	52-23-03
FORWARD ELECTRONIC SERVICE CENTER DOOR (S-1)	1	LOWER HALF OF FUSELAGE, CENTER LINE, FS 219; 112	52-43-02

*SEE WM EQUIPMENT LIST

M1-0000-21-1333

R R R Component Location Index
Figure 101
(Sheet 2)

R R 0018 EFFECTIVITY: ALL

COMPONENT	QTY	AREA/ACCESS	REFERENCE
DOOR SEALS:			
GALLEY DOOR (G-1)	1	LOWER HALF OF FUSELAGE, RIGHT, FS 810; 822	52-41-03
MID ELECTRICAL SERVICE CENTER DOOR (137AZ)	1	LOWER HALF OF FUSELAGE, RIGHT, FS 980; 137	52-43-04
PASSENGER CABIN DOORS:			
AFT (L3)	1	UPPER HALF OF FUSELAGE, LEFT, FS 1513; 834	52-11-52
AFT (R3)	1	UPPER HALF OF FUSELAGE, RIGHT, FS 1513; 844	52-11-52
CENTER (L2)	1	UPPER HALF OF FUSELAGE, LEFT, FS 878; 833	52-11-52
CENTER (R2)	1	UPPER HALF OF FUSELAGE, RIGHT, FS 878; 843	52-11-52
FORWARD (L1)	1	UPPER HALF OF FUSELAGE, LEFT, FS 304; 832	52-11-52
FORWARD (R1)	1	UPPER HALF OF FUSELAGE, RIGHT, FS 355; 842	52-11-52
LAMPS:			
MANUAL SWITCHLIGHT	2	FE/SO STATION, PANEL P11, CABIN PRESSURE CONTROL PANEL; 215	20-33-01
ECS ANNUNCIATOR LIGHT	1	PILOTS CENTER INSTRUMENT PANEL P2, CAUTION AND WARNING ANNUNCIATOR LIGHTS PANEL; 211	20-33-04
PANEL – CABIN PRESSURE CONTROL	1	FE/SO STATION PANEL P11; 215	21-31-02
PRESSURE SEALS:			
AFT FUSELAGE DUCT SEAL	1	LEFT HAND ATM COMPT PNEUMATIC DUCT, FS 1393; 195B	36-14-17
AFT FUSELAGE DUCT SEAL	1	AFT PRESSURE BULKHEAD, FS 1860; 316BB	36-14-17
DISTRIBUTION MANIFOLD DUCT SEALS	3	FORWARD AREA UNDERWING BOX, FS 983; 142DB	36-14-14
PACK DUCT SEAL	1	LEFT ECS COMPT, FS 449; 118CR	21-21-08
PACK DUCT SEALS	2	RIGHT ECS COMPT; FS 449; 118CR	21-21-08
4-INCH DUCT SEAL	1	RIGHT ECS COMPT, AFT BULKHEAD, FS 378; 118CR 116AR, 116AR-1	21-21-14

M1-0000-21-1338

R R R Component Location Index
Figure 101
(Sheet 3)

R R R EFFECTIVITY: ALL

001B

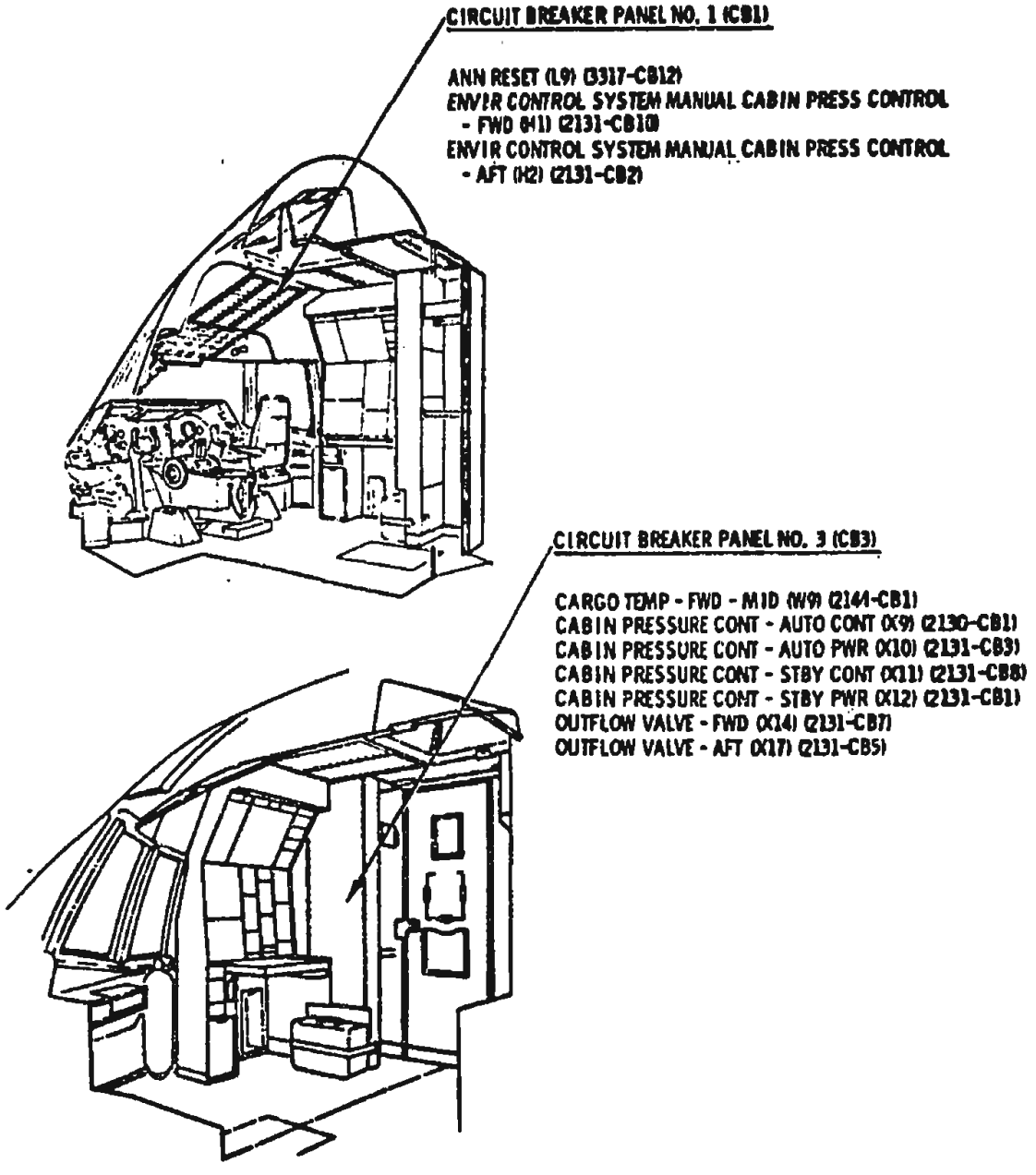
COMPONENT	QTY	AREA/ACCESS	REFERENCE
PRESSURE SEALS:			
7-INCH DUCT SEALS	3	LEFT ECS COMPT, FS 378 BULKHEAD, PACK 1; 117AL, 115AL, 115AL-1	21-21-15
7-INCH DUCT SEALS	3	RIGHT ECS COMPT, FS 378 BULKHEAD, PACK 2; 118CR, 116AR, 116AR-1	21-21-15
7-INCH DUCT SEALS	3	RIGHT ECS COMPT, FS 378 BULKHEAD, PACK 3; 118CR 116BR, 116BR-1	21-21-15
8-INCH SPECIAL DUCT SEAL	1	LEFT ECS COMPT, FS 378 BULKHEAD; 117AL	21-21-17
8-INCH STANDARD DUCT SEAL	1	RIGHT ECS COMPT, FS 378 BULKHEAD, PACK 2; 118CR, 116AR, 116AR-1	21-21-16
8-INCH STANDARD DUCT SEAL	1	RIGHT ECS COMPT, FS 378 BULKHEAD, PACK 3; 118CR 116BR, 116BR-1	21-21-16
RELAY – AIR/GROUND SENSING NO. 4 3263-K4	1	FESC, NOSE GEAR LIGHTS AND SENSING PANEL; 112AB	*

*SEE WM EQUIPMENT LIST

M1-0000-21-1340

R Component Location Index
R Figure 101
R (Sheet 4)

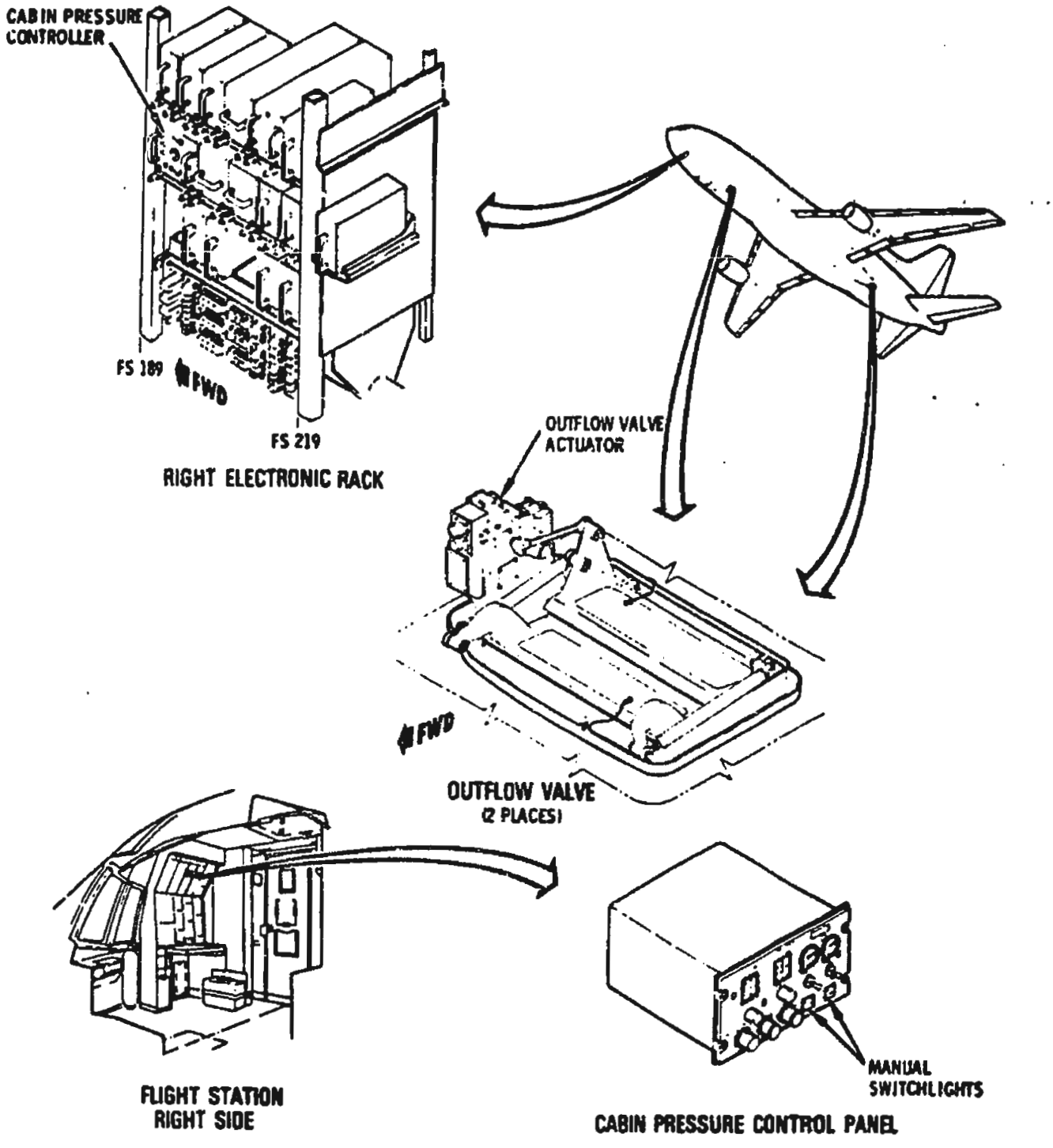
R EFFECTIVITY: ALL
R
001B


CIRCUIT BREAKER PANEL NO. 1 (CB1)
ANN RESET (L9) (3317-CB12)
ENVIR CONTROL SYSTEM MANUAL CABIN PRESS CONTROL - FWD (H1) (2131-CB10)
ENVIR CONTROL SYSTEM MANUAL CABIN PRESS CONTROL - AFT (H2) (2131-CB2)
CIRCUIT BREAKER PANEL NO. 3 (CB3)
CARGO TEMP - FWD - MID (W9) (2141-CB1)
CABIN PRESSURE CONT - AUTO CONT (X9) (2130-CB1)
CABIN PRESSURE CONT - AUTO PWR (X10) (2131-CB3)
CABIN PRESSURE CONT - STBY CONT (X11) (2131-CB8)
CABIN PRESSURE CONT - STBY PWR (X12) (2131-CB1)
OUTFLOW VALVE - FWD (X14) (2131-CB7)
OUTFLOW VALVE - AFT (X17) (2131-CB5)

M1-0000-21-1301

R Component Locator Diagram
R Figure 102
R (Sheet 1)

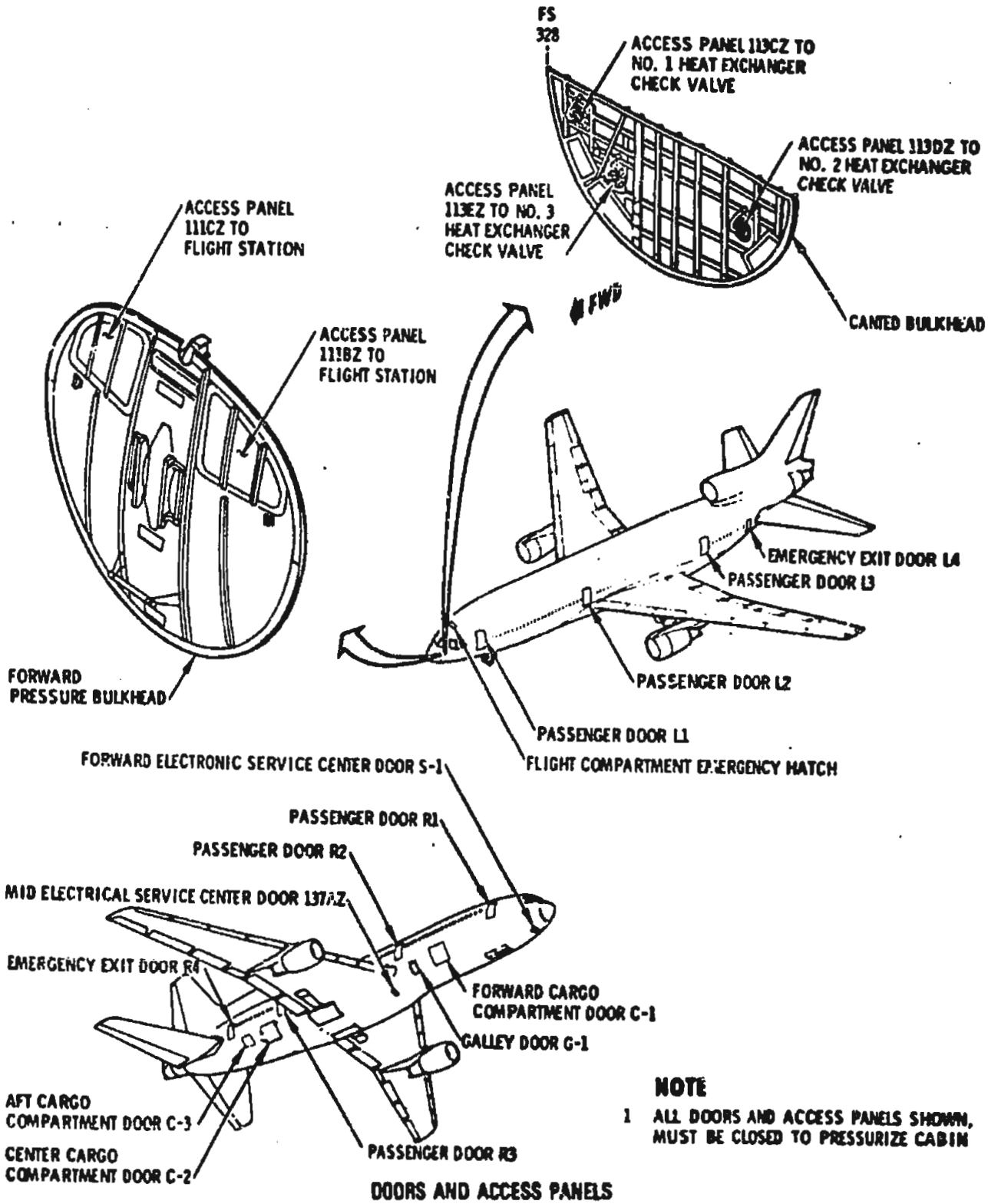
R EFFECTIVITY: ALL
R
001B



R
R
R Component Locator Diagram
Figure 102
(Sheet 2)

R EFFECTIVITY: ALL

R
R
0018


FS 328
ACCESS PANEL 113CZ TO NO. 1 HEAT EXCHANGER CHECK VALVE
ACCESS PANEL 113DZ TO NO. 2 HEAT EXCHANGER CHECK VALVE
ACCESS PANEL 113EZ TO NO. 3 HEAT EXCHANGER CHECK VALVE
CANTED BULKHEAD
ACCESS PANEL 111CZ TO FLIGHT STATION
ACCESS PANEL 111BZ TO FLIGHT STATION
FWD
FORWARD PRESSURE BULKHEAD
EMERGENCY EXIT DOOR L4
PASSENGER DOOR L3
PASSENGER DOOR L2
PASSENGER DOOR L1
FLIGHT COMPARTMENT EMERGENCY HATCH
FORWARD ELECTRONIC SERVICE CENTER DOOR S-1
PASSENGER DOOR R1
PASSENGER DOOR R2
MID ELECTRICAL SERVICE CENTER DOOR 137AZ
EMERGENCY EXIT DOOR R4
FORWARD CARGO COMPARTMENT DOOR C-1
GALLEY DOOR G-1
AFT CARGO COMPARTMENT DOOR C-3
CENTER CARGO COMPARTMENT DOOR C-2
PASSENGER DOOR R3

NOTE

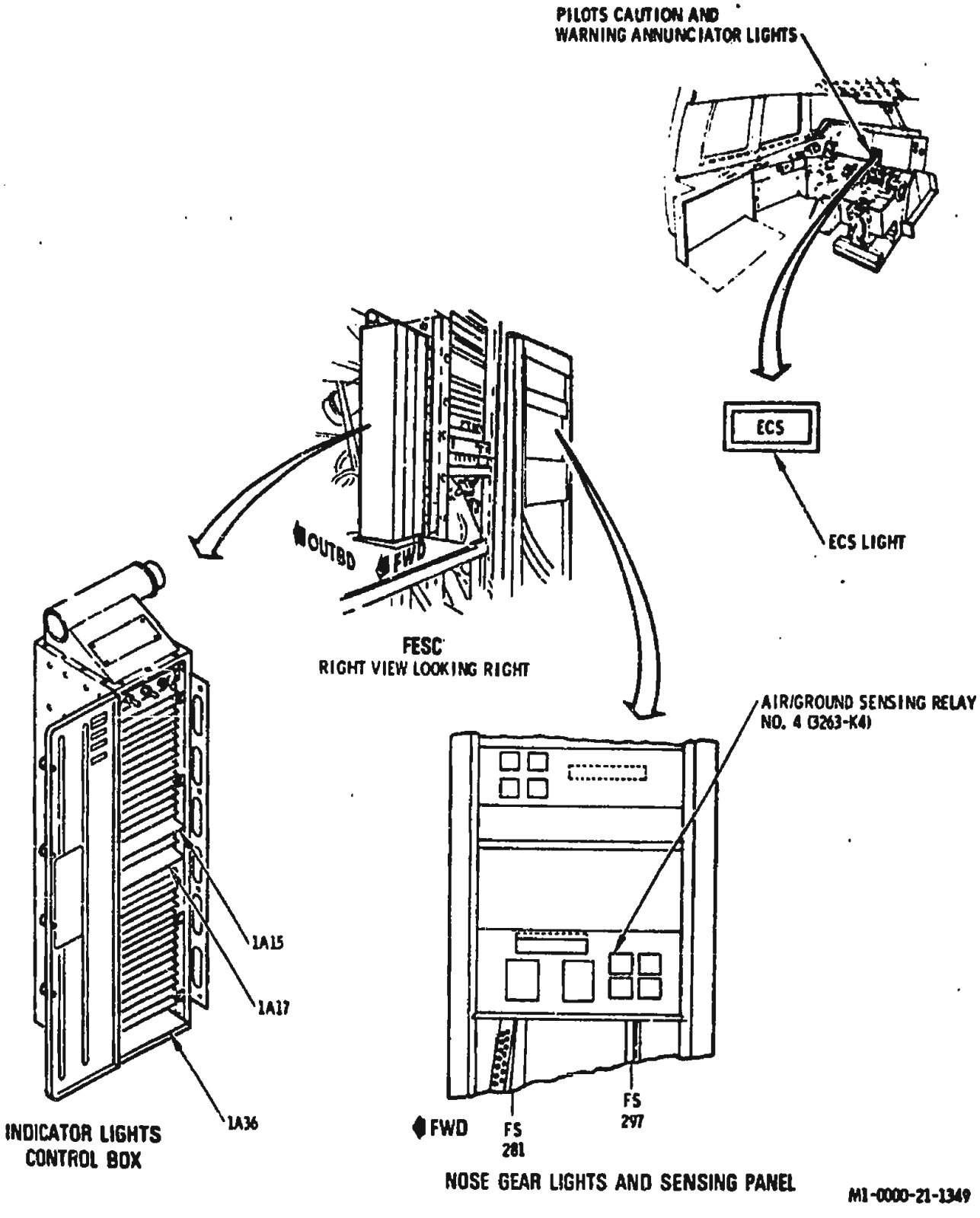
1 ALL DOORS AND ACCESS PANELS SHOWN, MUST BE CLOSED TO PRESSURIZE CABIN

DOORS AND ACCESS PANELS

M1-0000-21-1344

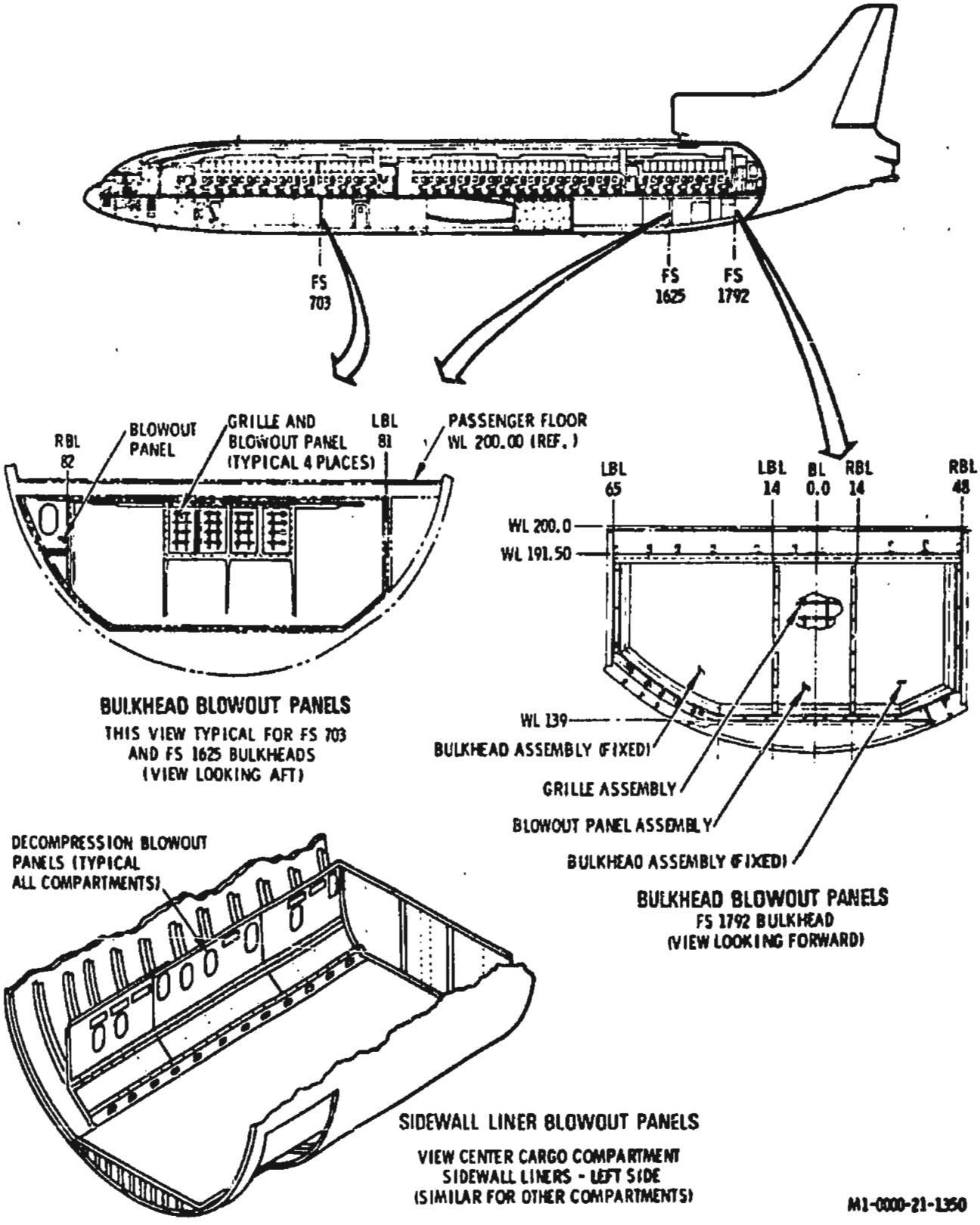
R Component Locator Diagram
R Figure 102
R (Sheet 3)

R EFFECTIVITY: ALL
R
001B



R
R
R

Component Locator Diagram
Figure 102
(Sheet 4)

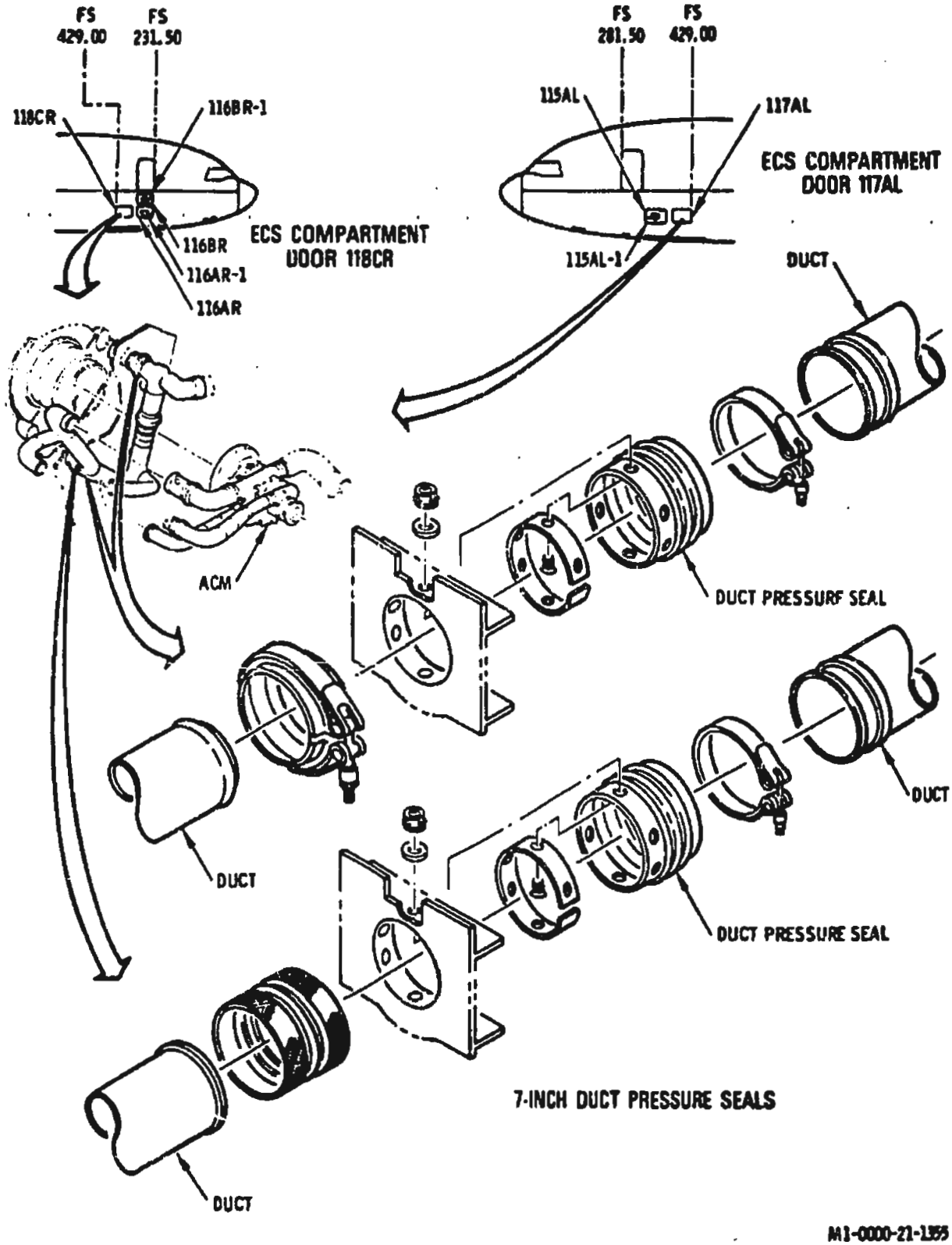


R
R
R

Component Locator Diagram
Figure 102
(Sheet 5)

EFFECTIVITY: ALL

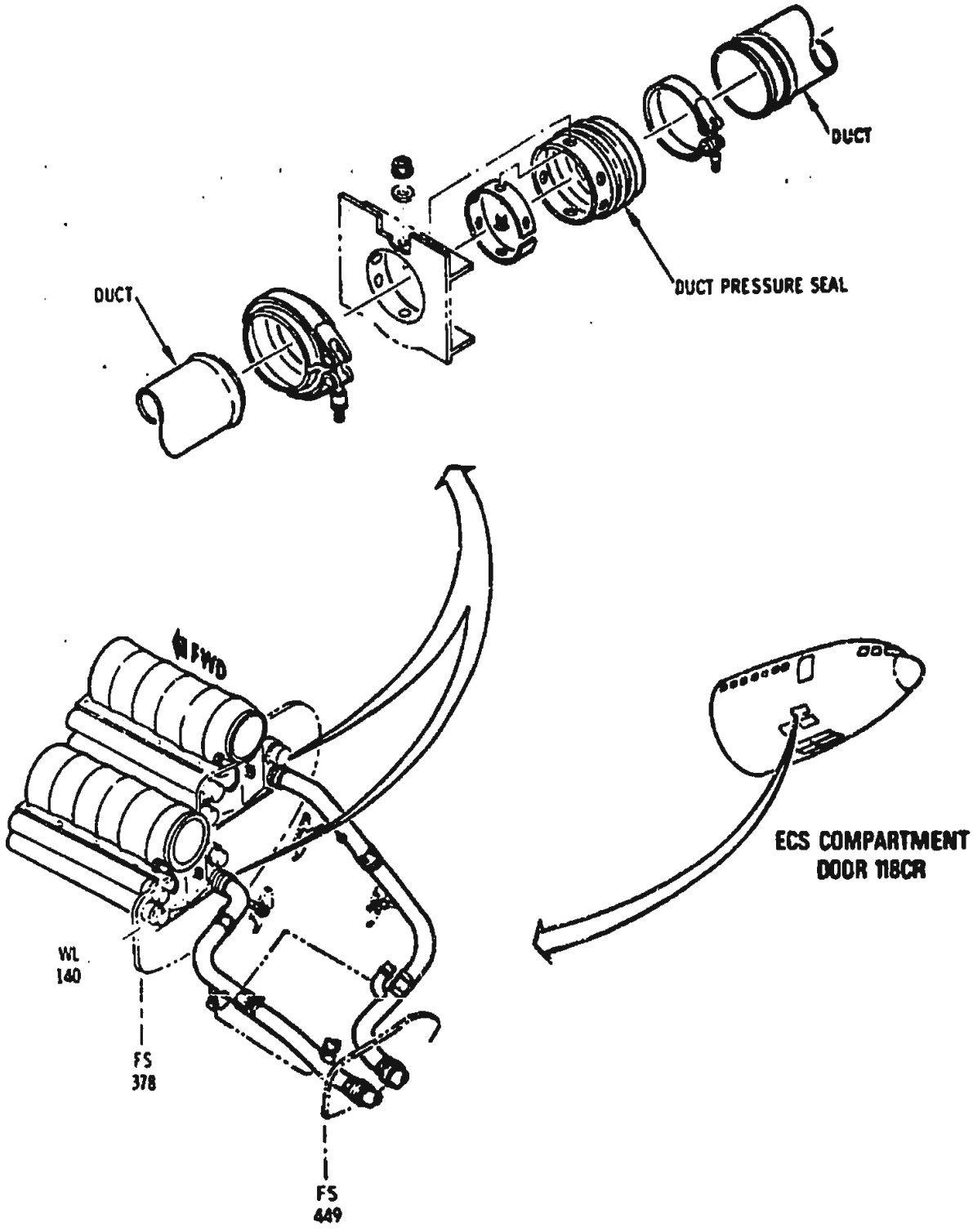
001B



R Component Locator Diagram
R Figure 102
R (Sheet 6)

R EFFECTIVITY: ALL

R
R
001B

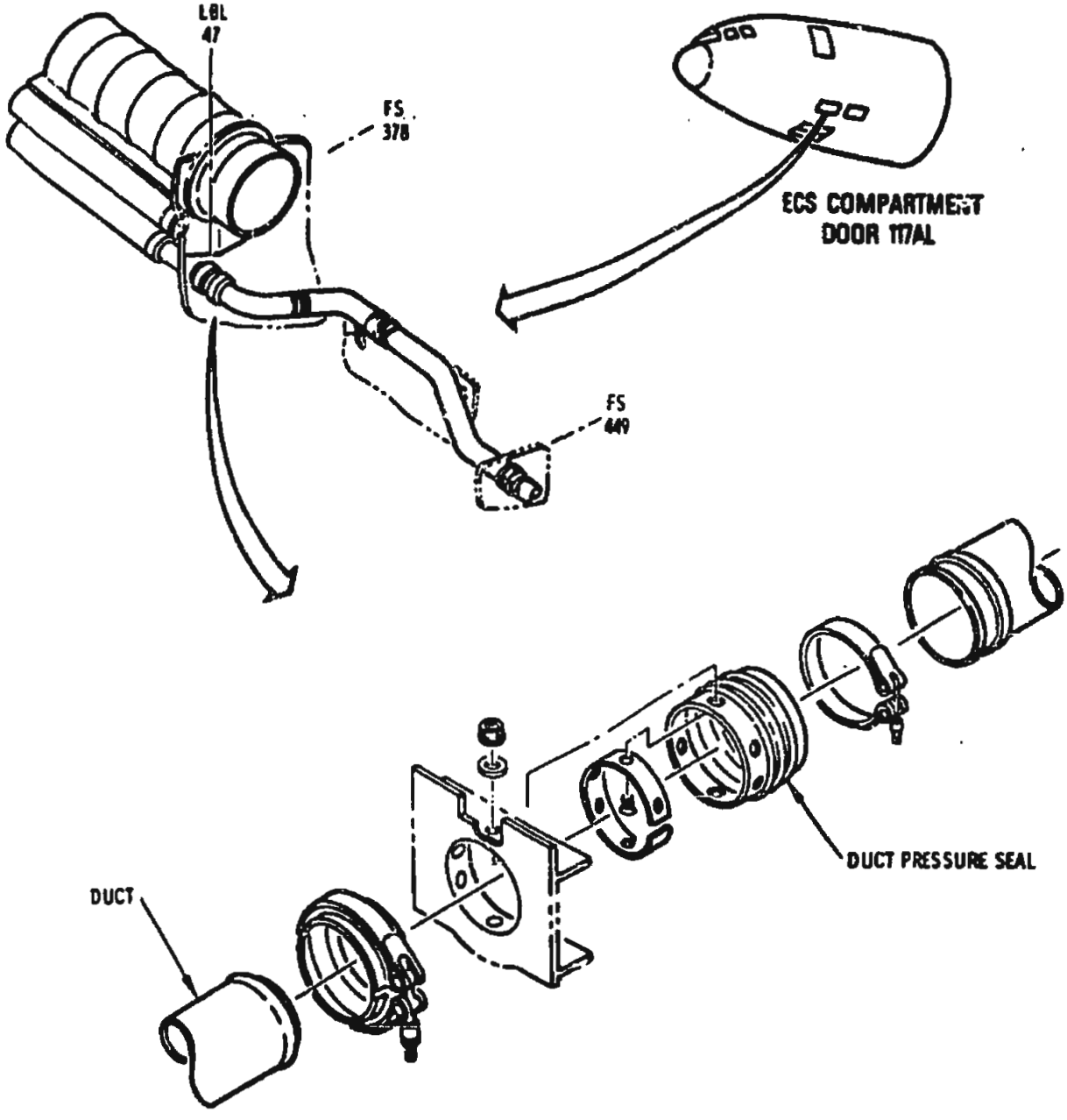


EIGHT–INCH STANDARD DUCT PRESSURE SEAL

M1-0000-21-1356

R
R
R Component Locator Diagram
Figure 102
(Sheet 7)

R EFFECTIVITY: ALL
R
R
001B

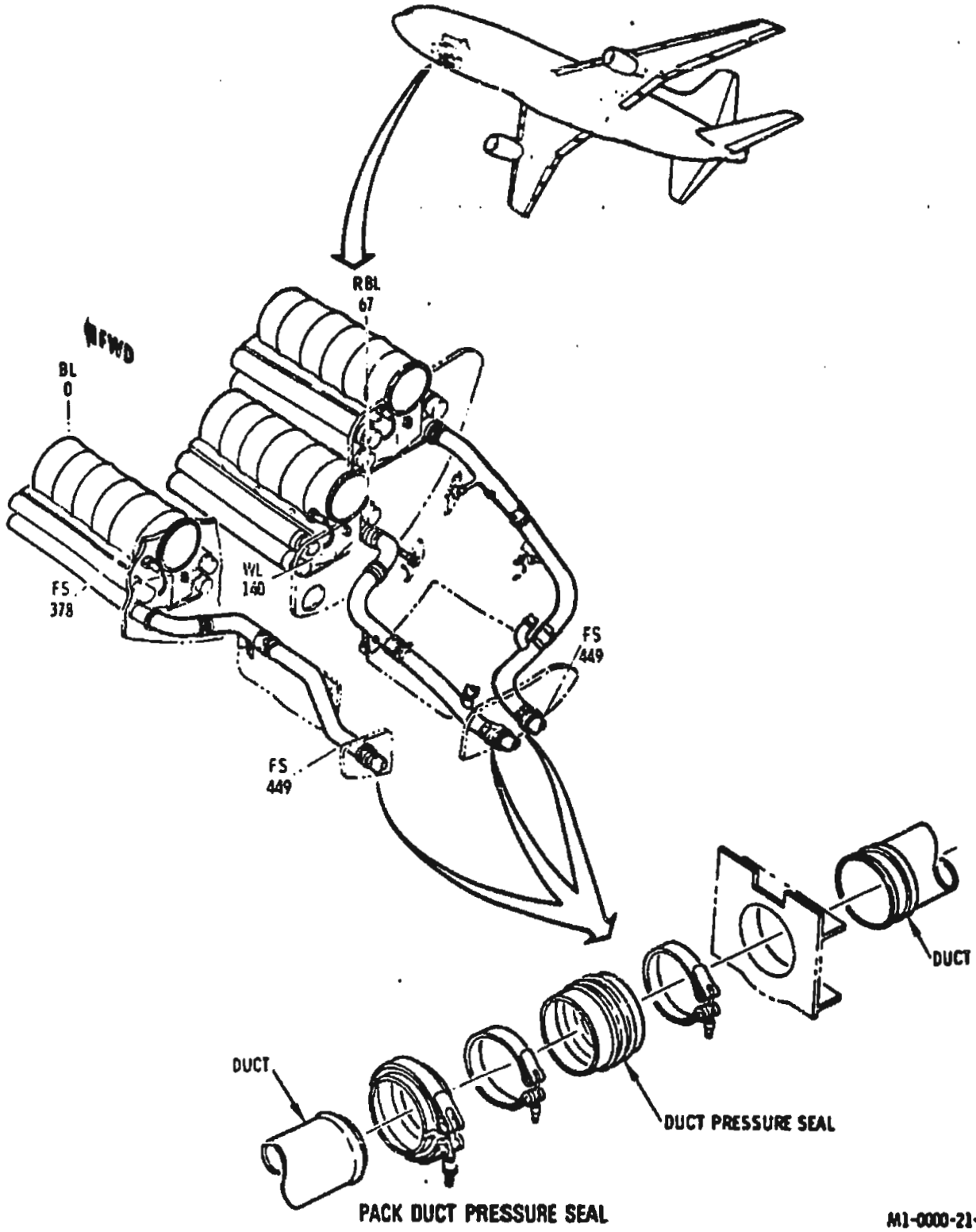


8 INCH SPECIAL DUCT PRESSURE SEAL

M1-0000-21-1357

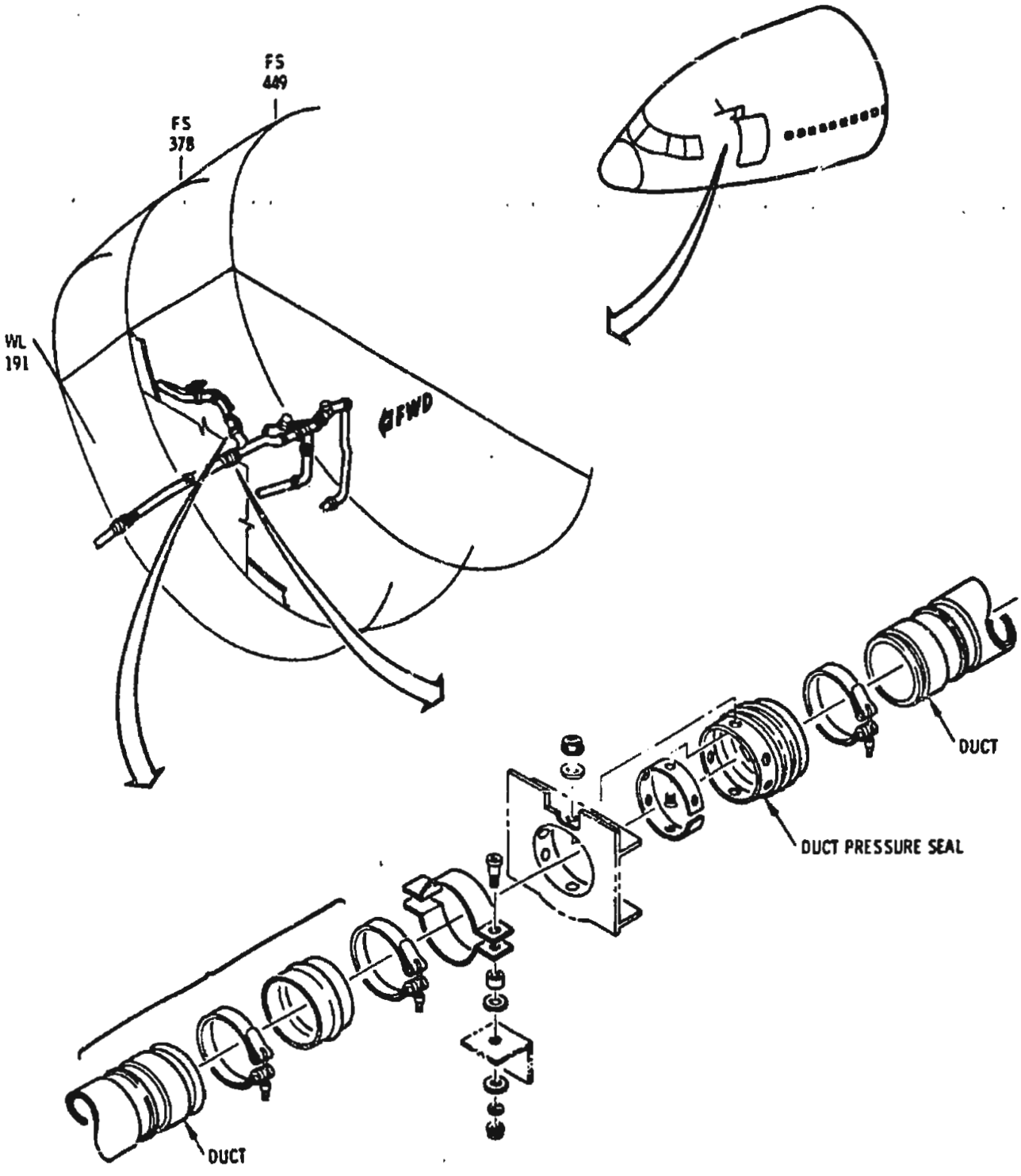
R Component Locator Diagram
R Figure 102
R (Sheet 8)

R EFFECTIVITY: ALL
R
001B



R Component Locator Diagram
R Figure 102
R (Sheet 9)

R EFFECTIVITY: ALL

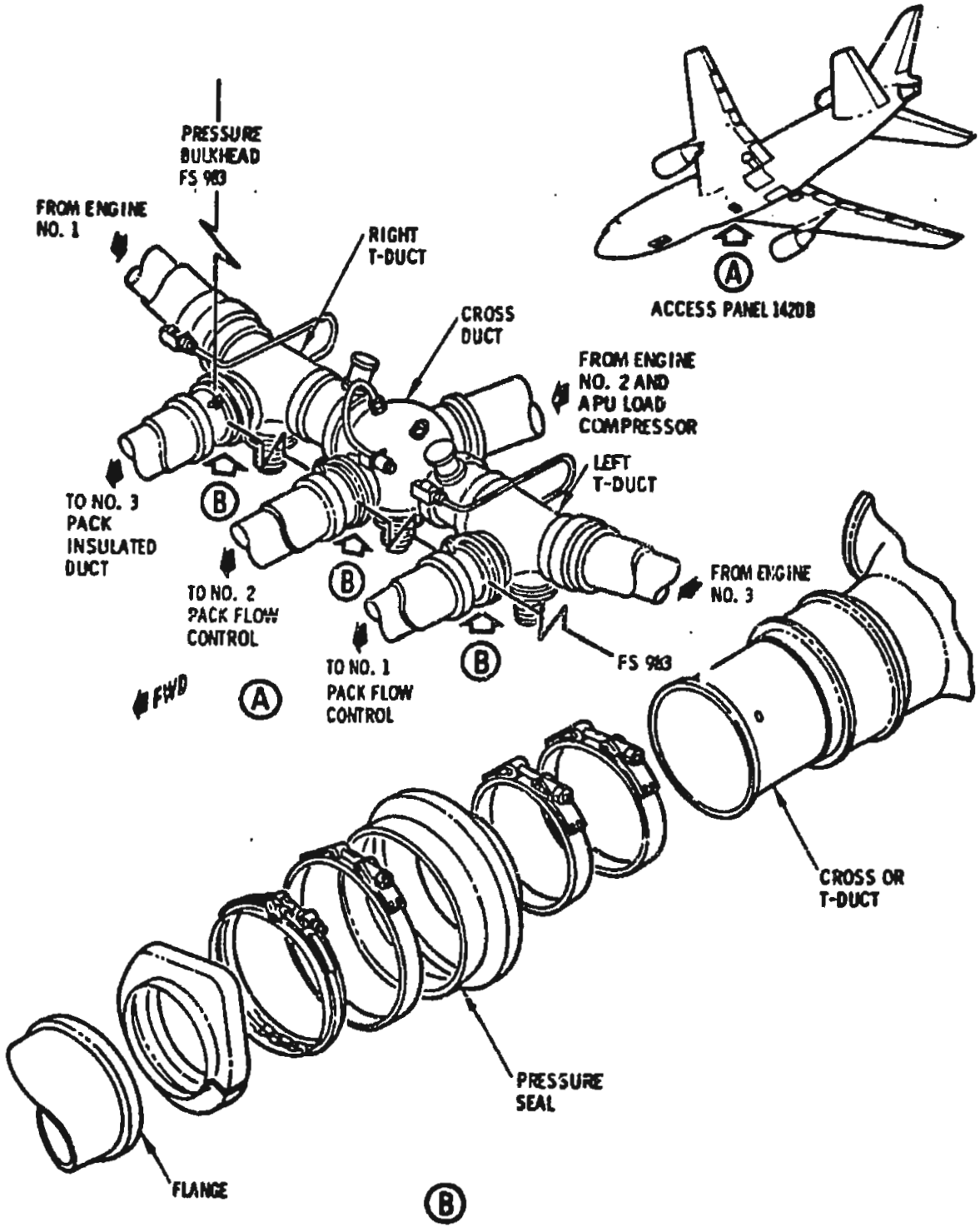


4–INCH DUCT PRESSURE SEAL

M1-0000-21-1359

R Component Locator Diagram
R Figure 102
R (Sheet 10)

R EFFECTIVITY: ALL
R
001B

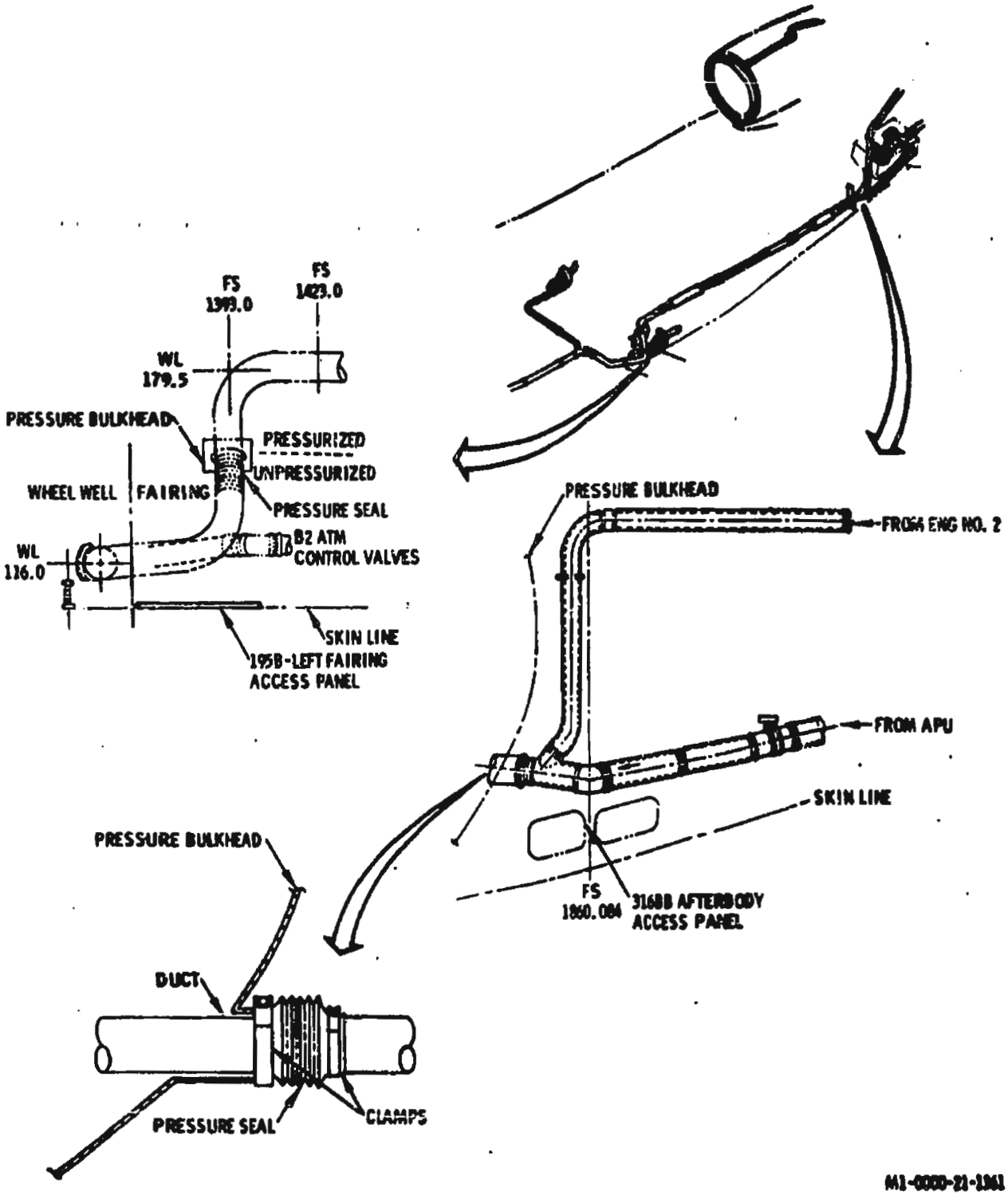


DISTRIBUTION MANIFOLD DUCT PRESSURE SEAL

MI-0000-21-1360

R Component Locator Diagram
R Figure 102
R (Sheet 11)

R EFFECTIVITY: ALL
R
0018

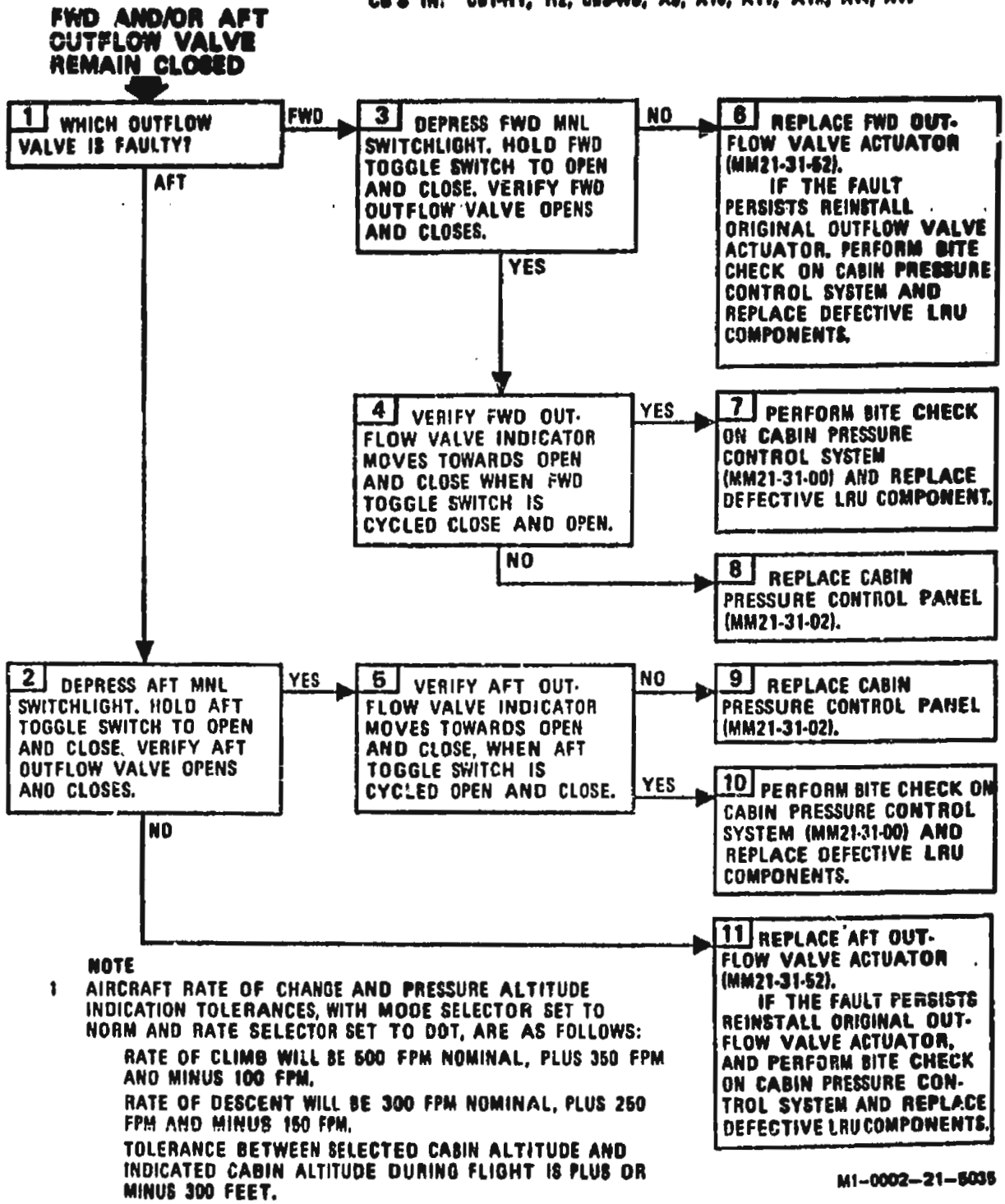


M1-0000-21-1961

R Component Locator Diagram
R Figure 102
R (Sheet 12)

R EFFECTIVITY: ALL

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: CB1-H1, H2; CB3-W8, X9, X10, X11, X12, X14, X17


FWD AND/OR AFT OUTFLOW VALVE REMAIN CLOSED
1 WHICH OUTFLOW VALVE IS FAULTY?
FWD
AFT
3 DEPRESS FWD MNL SWITCHLIGHT. HOLD FWD TOGGLE SWITCH TO OPEN AND CLOSE. VERIFY FWD OUTFLOW VALVE OPENS AND CLOSES.
NO
6 REPLACE FWD OUTFLOW VALVE ACTUATOR (MM21-31-52). IF THE FAULT PERSISTS REINSTALL ORIGINAL OUTFLOW VALVE ACTUATOR. PERFORM BITE CHECK ON CABIN PRESSURE CONTROL SYSTEM AND REPLACE DEFECTIVE LRU COMPONENTS.
YES
4 VERIFY FWD OUTFLOW VALVE INDICATOR MOVES TOWARDS OPEN AND CLOSE WHEN FWD TOGGLE SWITCH IS CYCLED CLOSE AND OPEN.
YES
7 PERFORM BITE CHECK ON CABIN PRESSURE CONTROL SYSTEM (MM21-31-00) AND REPLACE DEFECTIVE LRU COMPONENT.
NO
8 REPLACE CABIN PRESSURE CONTROL PANEL (MM21-31-02).
2 DEPRESS AFT MNL SWITCHLIGHT. HOLD AFT TOGGLE SWITCH TO OPEN AND CLOSE. VERIFY AFT OUTFLOW VALVE OPENS AND CLOSES.
YES
5 VERIFY AFT OUTFLOW VALVE INDICATOR MOVES TOWARDS OPEN AND CLOSE, WHEN AFT TOGGLE SWITCH IS CYCLED OPEN AND CLOSE.
NO
9 REPLACE CABIN PRESSURE CONTROL PANEL (MM21-31-02).
YES
10 PERFORM BITE CHECK ON CABIN PRESSURE CONTROL SYSTEM (MM21-31-00) AND REPLACE DEFECTIVE LRU COMPONENTS.
NO
11 REPLACE AFT OUTFLOW VALVE ACTUATOR (MM21-31-52). IF THE FAULT PERSISTS REINSTALL ORIGINAL OUTFLOW VALVE ACTUATOR, AND PERFORM BITE CHECK ON CABIN PRESSURE CONTROL SYSTEM AND REPLACE DEFECTIVE LRU COMPONENTS.

NOTE

1 AIRCRAFT RATE OF CHANGE AND PRESSURE ALTITUDE INDICATION TOLERANCES, WITH MODE SELECTOR SET TO NORM AND RATE SELECTOR SET TO DOT, ARE AS FOLLOWS:

RATE OF CLIMB WILL BE 500 FPM NOMINAL, PLUS 350 FPM AND MINUS 100 FPM.

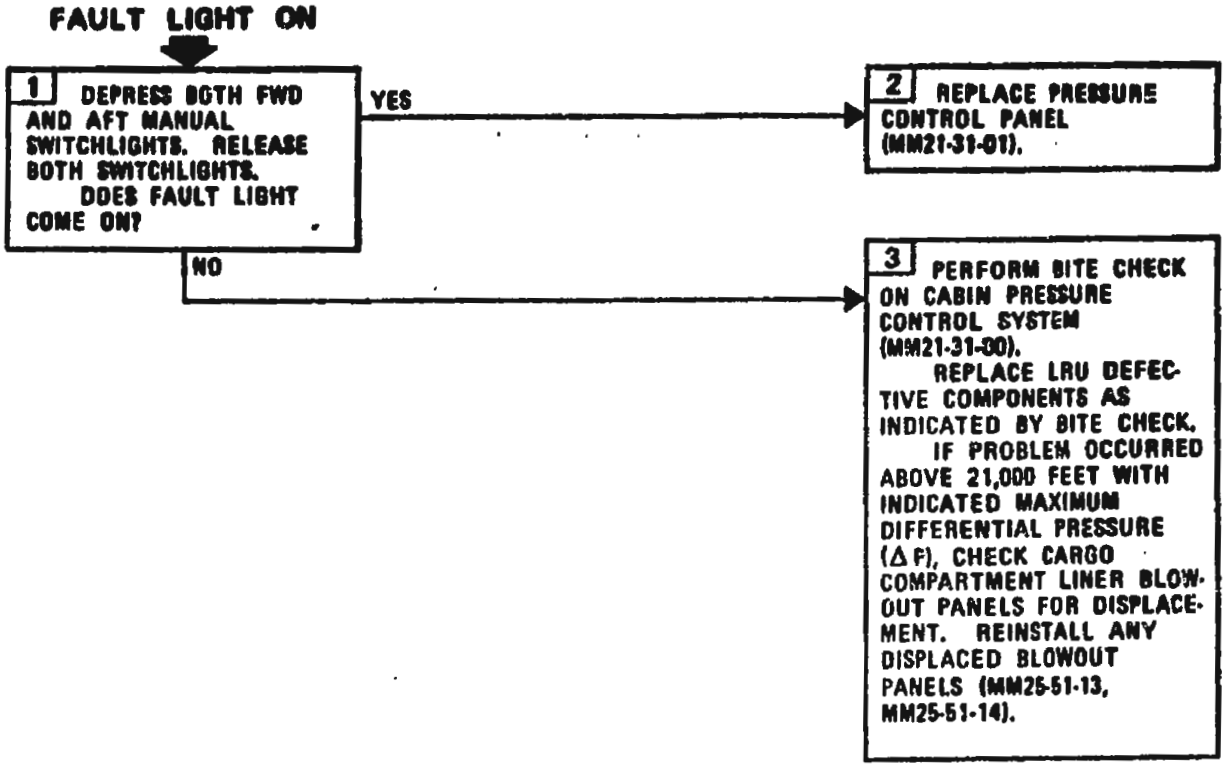
RATE OF DESCENT WILL BE 300 FPM NOMINAL, PLUS 250 FPM AND MINUS 150 FPM.

TOLERANCE BETWEEN SELECTED CABIN ALTITUDE AND INDICATED CABIN ALTITUDE DURING FLIGHT IS PLUS OR MINUS 300 FEET.

M1-0002-21-5035

R FWD and/or AFT Outflow Valve Check
R Figure 103

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: CB1-L8; CB3-X8, X10, X11, X12, X14, X17


FAULT LIGHT ON
1 DEPRESS BOTH FWD AND AFT MANUAL SWITCHLIGHTS. RELEASE BOTH SWITCHLIGHTS.
DOES FAULT LIGHT COME ON?
YES
2 REPLACE PRESSURE CONTROL PANEL (MM21-31-01).
NO
3 PERFORM BITE CHECK ON CABIN PRESSURE CONTROL SYSTEM (MM21-31-00).
REPLACE LRU DEFECTIVE COMPONENTS AS INDICATED BY BITE CHECK.
IF PROBLEM OCCURRED ABOVE 21,000 FEET WITH INDICATED MAXIMUM DIFFERENTIAL PRESSURE (ΔP), CHECK CARGO COMPARTMENT LINER BLOWOUT PANELS FOR DISPLACEMENT. REINSTALL ANY DISPLACED BLOWOUT PANELS (MM25-51-13, MM25-51-14).

NOTE

1 AIRCRAFT RATE OF CHANGE AND PRESSURE ALTITUDE INDICATION TOLERANCES, WITH MODE SELECTOR SET TO NORM AND RATE SELECTOR SET TO DOT, ARE AS FOLLOWS:

RATE OF CLIMB WILL BE 500 FPM NOMINAL, PLUS 350 FPM AND MINUS 100 FPM.

RATE OF DESCENT WILL BE 300 FPM NOMINAL, PLUS 250 FPM AND MINUS 150 FPM.

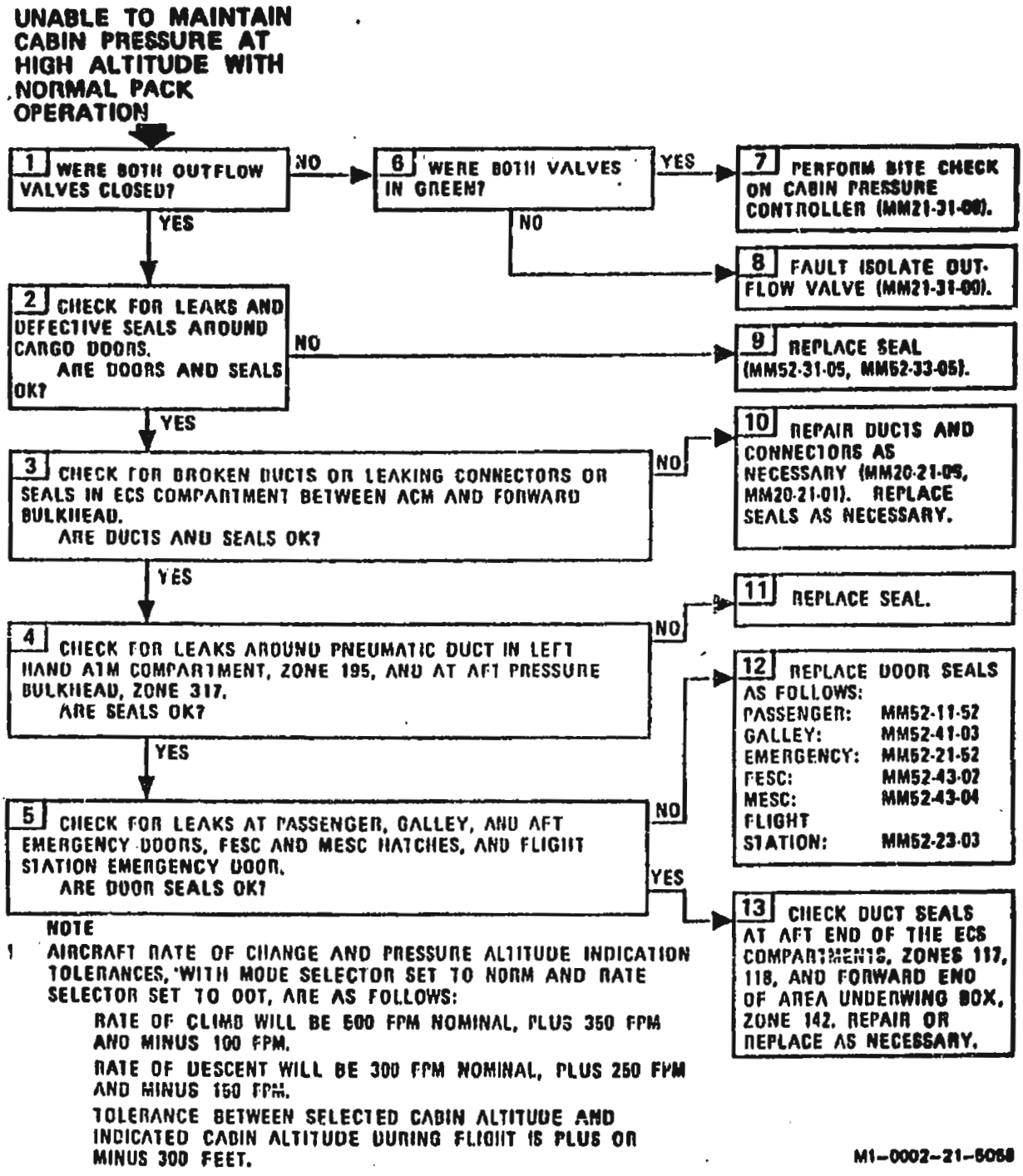
TOLERANCE BETWEEN SELECTED CABIN ALTITUDE AND INDICATED CABIN ALTITUDE DURING FLIGHT IS PLUS OR MINUS 300 FEET.

M1-0003-21-5036

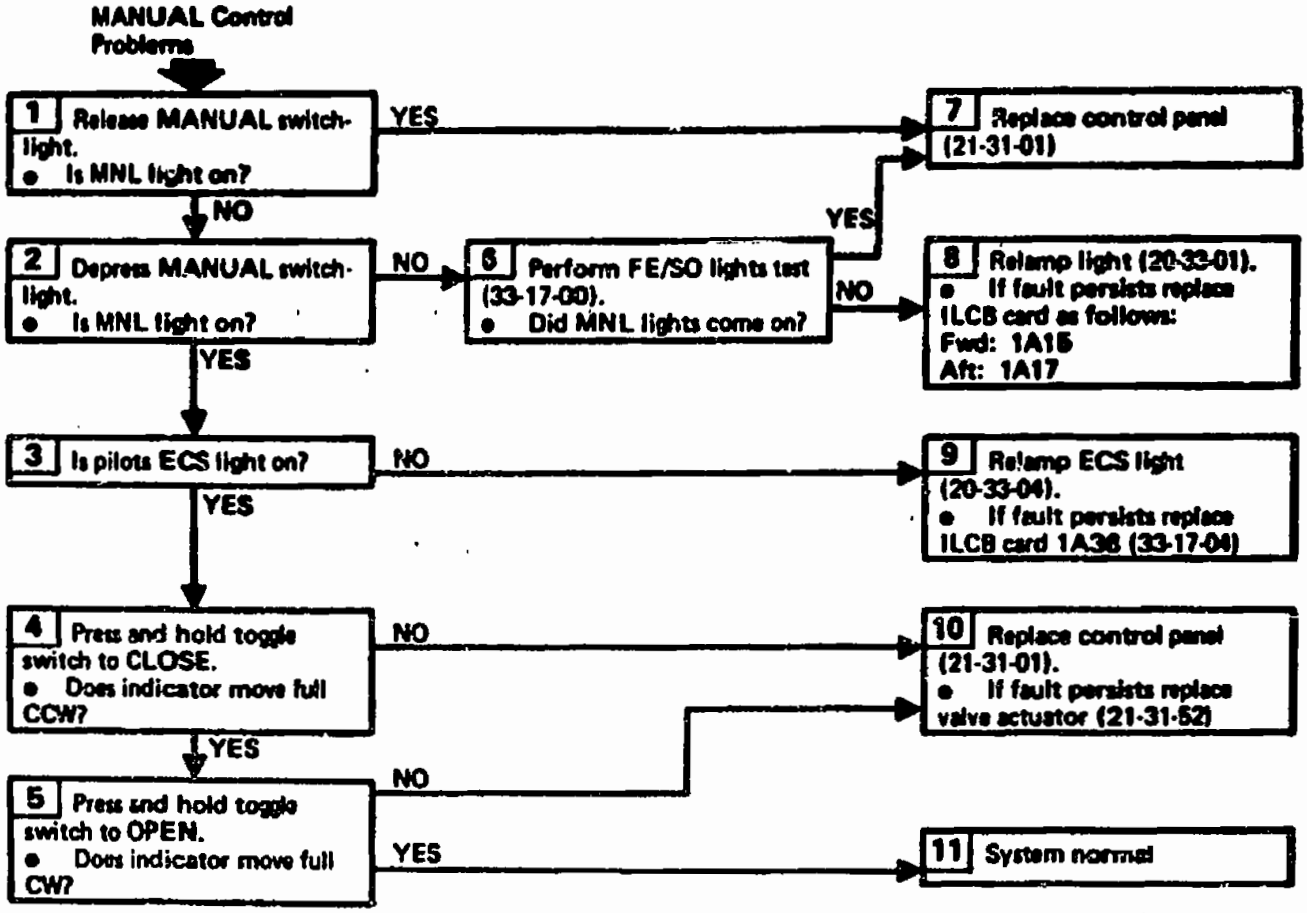
R
R

Cabin Pressure Fault Light on
Figure 104

PREREQUISITES
ECS OPERATING (MM21-00-00)
ALL DOORS CLOSED AND CABIN PRESSURIZED (MM21-31-00)


UNABLE TO MAINTAIN CABIN PRESSURE AT HIGH ALTITUDE WITH NORMAL PACK OPERATION
1 WERE BOTH OUTFLOW VALVES CLOSED?
NO
6 WERE BOTH VALVES IN GREEN?
YES
7 PERFORM BITE CHECK ON CABIN PRESSURE CONTROLLER (MM21-31-00).
NO
8 FAULT ISOLATE OUTFLOW VALVE (MM21-31-00).
YES
2 CHECK FOR LEAKS AND DEFECTIVE SEALS AROUND CARGO DOORS.
ARE DOORS AND SEALS OK?
NO
9 REPLACE SEAL (MM52-31-05, MM52-33-05).
YES
3 CHECK FOR BROKEN DUCTS OR LEAKING CONNECTORS OR SEALS IN ECS COMPARTMENT BETWEEN ACM AND FORWARD BULKHEAD.
ARE DUCTS AND SEALS OK?
NO
10 REPAIR DUCTS AND CONNECTORS AS NECESSARY (MM20-21-05, MM20-21-01). REPLACE SEALS AS NECESSARY.
YES
4 CHECK FOR LEAKS AROUND PNEUMATIC DUCT IN LEFT HAND ATM COMPARTMENT, ZONE 195, AND AT AFT PRESSURE BULKHEAD, ZONE 317.
ARE SEALS OK?
NO
11 REPLACE SEAL.
YES
5 CHECK FOR LEAKS AT PASSENGER, GALLEY, AND AFT EMERGENCY DOORS, FESC AND MESC HATCHES, AND FLIGHT STATION EMERGENCY DOOR.
ARE DOOR SEALS OK?
NO
12 REPLACE DOOR SEALS AS FOLLOWS:
PASSENGER: MM52-11-52
GALLEY: MM52-41-03
EMERGENCY: MM52-21-52
FESC: MM52-43-02
MESC: MM52-43-04
FLIGHT STATION: MM52-23-03
YES
13 CHECK DUCT SEALS AT AFT END OF THE ECS COMPARTMENTS, ZONES 117, 118, AND FORWARD END OF AREA UNDERWING BOX, ZONE 142. REPAIR OR REPLACE AS NECESSARY.
NOTE
1 AIRCRAFT RATE OF CHANGE AND PRESSURE ALTITUDE INDICATION TOLERANCES, WITH MODE SELECTOR SET TO NORM AND RATE SELECTOR SET TO OUT, ARE AS FOLLOWS:
RATE OF CLIMB WILL BE 500 FPM NOMINAL, PLUS 350 FPM AND MINUS 100 FPM.
RATE OF DESCENT WILL BE 300 FPM NOMINAL, PLUS 250 FPM AND MINUS 150 FPM.
TOLERANCE BETWEEN SELECTED CABIN ALTITUDE AND INDICATED CABIN ALTITUDE DURING FLIGHT IS PLUS OR MINUS 300 FEET.
M1-0002-21-6058

R Unable to Maintain Cabin Pressure at High
R Altitude with Normal Pack Operation
R Figure 105

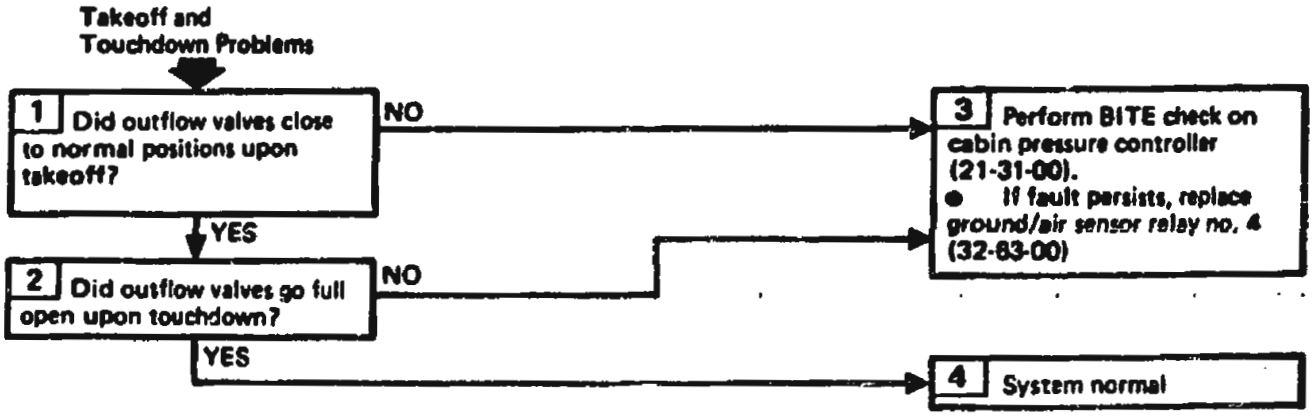


PREREQUISITES
Electric Pwr: 24-00-00
CB's in: 1H1, 2, 3W9

M1-0100-21-0000

R Cabin Pressure MANUAL Control Problems
R Figure 106

R EFFECTIVITY: ALL


Takeoff and Touchdown Problems
1 Did outflow valves close to normal positions upon takeoff?
NO
YES
2 Did outflow valves go full open upon touchdown?
NO
YES
3 Perform BITE check on cabin pressure controller (21-31-00).
● If fault persists, replace ground/air sensor relay no. 4 (32-83-00)
4 System normal

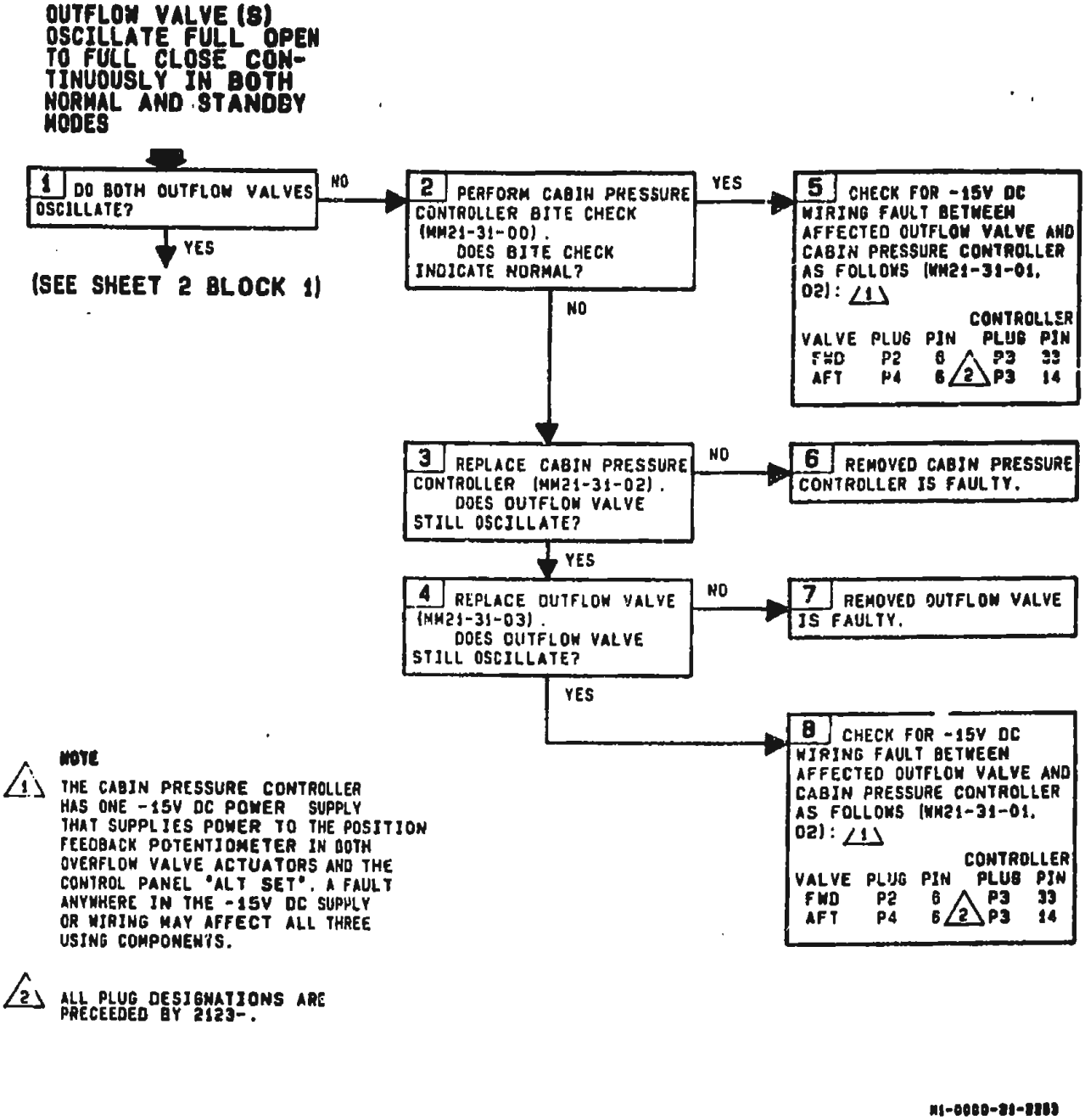
PREREQUISITES
Elec Pwr (24-00-00)
CB's in: 1H1, 2; 3W9; 3X9, 10, 11, 12, 14, and 17

M1-0100-21-5120

R R Takeoff and Touchdown Problems
Figure 107

R R 001B EFFECTIVITY: ALL

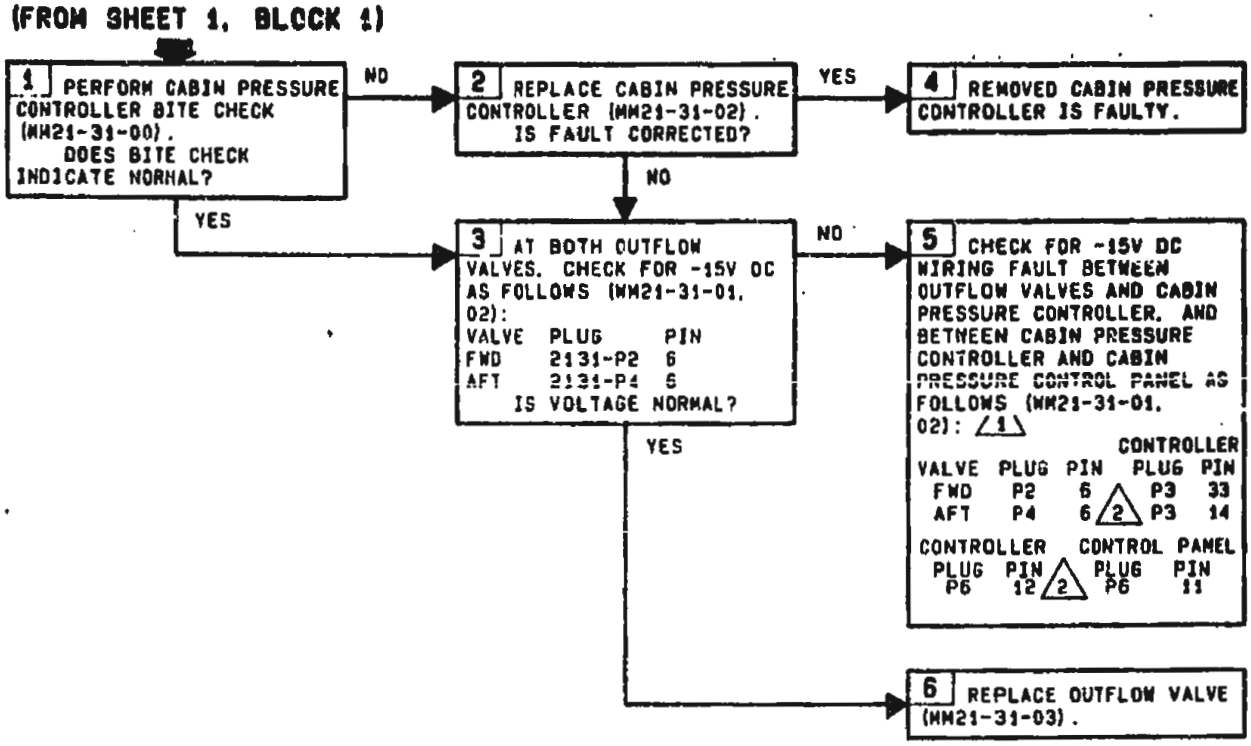
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S IN: CB1-H1, H2, CB3-X8, X10, X11, X12, X14, X17


OUTFLOW VALVE(S) OSCILLATE FULL OPEN TO FULL CLOSE CONTINUOUSLY IN BOTH NORMAL AND STANDBY MODES
1 DO BOTH OUTFLOW VALVES OSCILLATE?
NO
YES
(SEE SHEET 2 BLOCK 1)
2 PERFORM CABIN PRESSURE CONTROLLER BITE CHECK (MM21-31-00). DOES BITE CHECK INDICATE NORMAL?
YES
NO
5 CHECK FOR -15V DC WIRING FAULT BETWEEN AFFECTED OUTFLOW VALVE AND CABIN PRESSURE CONTROLLER AS FOLLOWS (MM21-31-01, 02): /1\
VALVE PLUG PIN CONTROLLER PLUG PIN
FWD P2 6 /2\ P3 33
AFT P4 6 /2\ P3 14
3 REPLACE CABIN PRESSURE CONTROLLER (MM21-31-02). DOES OUTFLOW VALVE STILL OSCILLATE?
NO
6 REMOVED CABIN PRESSURE CONTROLLER IS FAULTY.
YES
4 REPLACE OUTFLOW VALVE (MM21-31-03). DOES OUTFLOW VALVE STILL OSCILLATE?
NO
7 REMOVED OUTFLOW VALVE IS FAULTY.
YES
8 CHECK FOR -15V DC WIRING FAULT BETWEEN AFFECTED OUTFLOW VALVE AND CABIN PRESSURE CONTROLLER AS FOLLOWS (MM21-31-01, 02): /1\
VALVE PLUG PIN CONTROLLER PLUG PIN
FWD P2 6 /2\ P3 33
AFT P4 6 /2\ P3 14
/1\ NOTE
THE CABIN PRESSURE CONTROLLER HAS ONE -15V DC POWER SUPPLY THAT SUPPLIES POWER TO THE POSITION FEEDBACK POTENTIOMETER IN BOTH OVERFLOW VALVE ACTUATORS AND THE CONTROL PANEL 'ALT SET'. A FAULT ANYWHERE IN THE -15V DC SUPPLY OR WIRING MAY AFFECT ALL THREE USING COMPONENTS.
/2\ ALL PLUG DESIGNATIONS ARE PRECEEDED BY 2123-.

R
R Outflow Valves Oscillation Problems
Figure 108 (Sheet 1)

R EFFECTIVITY: ALL
R
001B

PREREQUISITES
SEE SHEET 1


(FROM SHEET 1, BLOCK 1)
1 PERFORM CABIN PRESSURE CONTROLLER BITE CHECK (MM21-31-00). DOES BITE CHECK INDICATE NORMAL?
NO
2 REPLACE CABIN PRESSURE CONTROLLER (MM21-31-02). IS FAULT CORRECTED?
YES
4 REMOVED CABIN PRESSURE CONTROLLER IS FAULTY.
NO
YES
3 AT BOTH OUTFLOW VALVES, CHECK FOR -15V DC AS FOLLOWS (MM21-31-01, 02):
VALVE PLUG PIN
FWD 2131-P2 6
AFT 2131-P4 6
IS VOLTAGE NORMAL?
NO
5 CHECK FOR -15V DC WIRING FAULT BETWEEN OUTFLOW VALVES AND CABIN PRESSURE CONTROLLER, AND BETWEEN CABIN PRESSURE CONTROLLER AND CABIN PRESSURE CONTROL PANEL AS FOLLOWS (MM21-31-01, 02): 1
VALVE PLUG PIN CONTROLLER PLUG PIN
FWD P2 6 P3 33
AFT P4 6 2 P3 14
CONTROLLER PLUG PIN CONTROL PANEL PLUG PIN
P6 12 2 P6 11
YES
6 REPLACE OUTFLOW VALVE (MM21-31-03).

NOTE

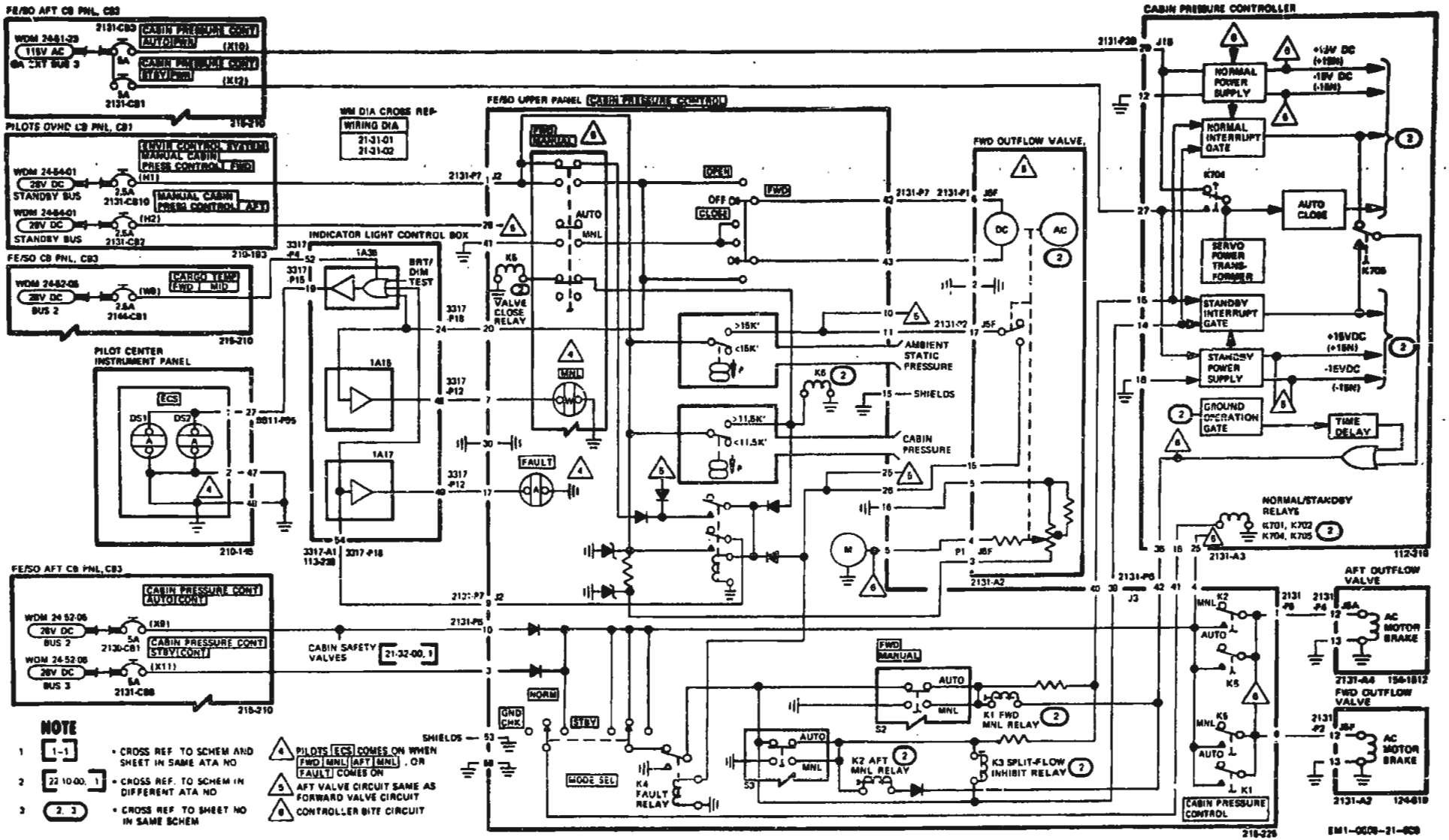
1 THE CABIN PRESSURE CONTROLLER HAS ONE -15V DC POWER SUPPLY THAT SUPPLYS POWER TO THE POSITION FEEDBACK POTENTIOMETER IN BOTH OVERFLOW VALVE ACTUATORS AND THE CONTROL PANEL "ALT SET". A FAULT ANYWHERE IN THE -15V DC SUPPLY OR WIRING MAY AFFECT ALL THREE USING COMPONENTS.

2 ALL PLUG DESIGNATIONS ARE PRECEEDED BY 2123-.

M1-0000-21-2250

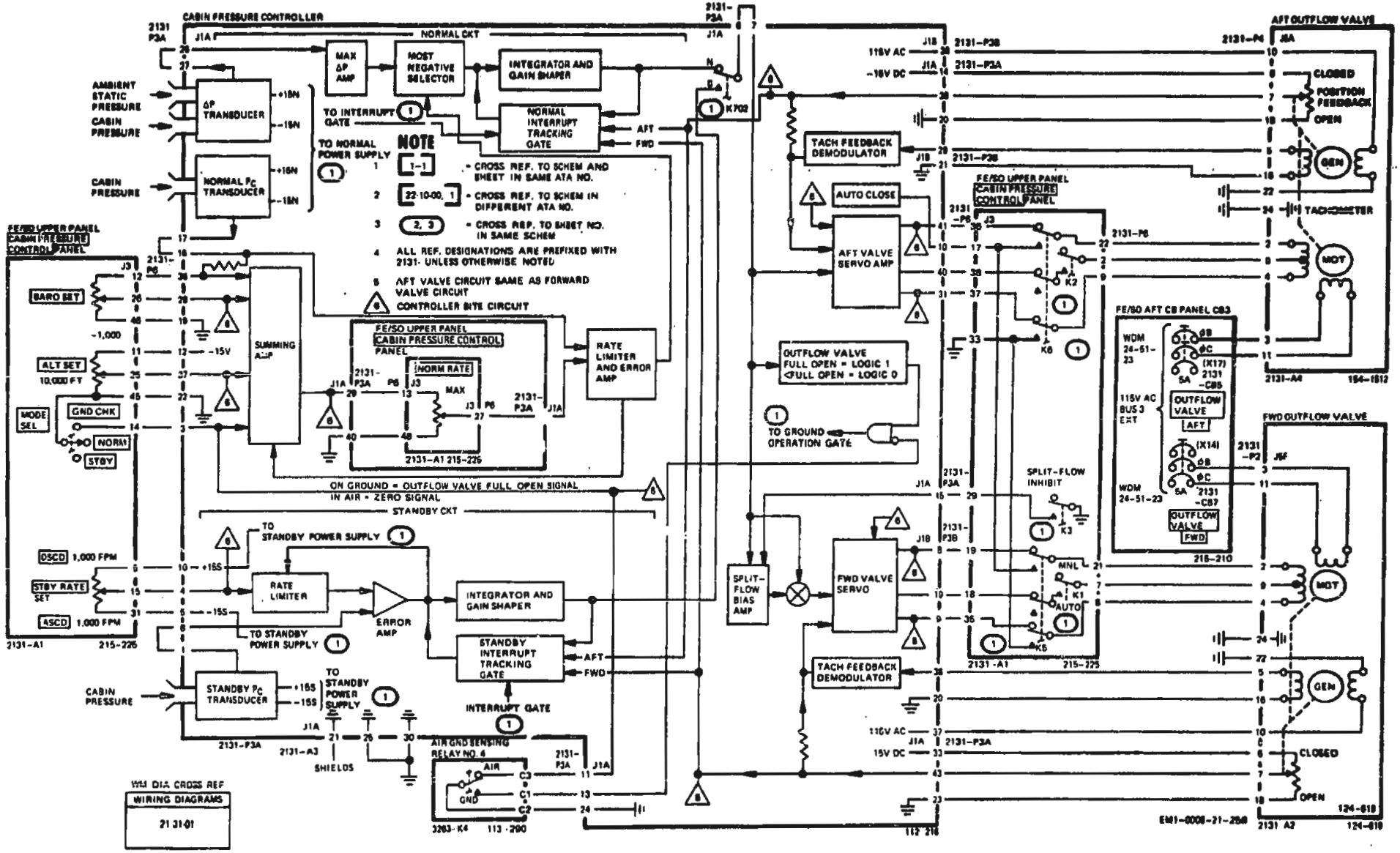
R Outflow Valves Oscillation Problems
R Figure 108 (Sheet 2)

R EFFECTIVITY: ALL
R
001B



Cabin Pressure Control Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: ALL
R
0018



Cabin Pressure Control Schematic
SCHEM 1 (Sheet 2)

R EFFECTIVITY: ALL
R
001B

R
R

CABIN PRESSURE CONTROL SYSTEM
MAINTENANCE PRACTICES

1. General

This maintenance practice contains the procedure for operating the Pressurization System to the maximum differential pressure. (For operation to -1000 feet, refer to 21-31-00, 501).

Due to the large volume of the fuselage, a potentially dangerous condition is created whenever the fuselage is pressurized. Therefore, extreme care should be taken in following this specified schedule and its safety precautions.

2. Equipment and Materials

Differential Gage, Lockheed PN P-6818-TSP or equivalent

3. Reference Procedures

21-00-00	Air Conditioning System - Maintenance Practices
21-31-00	Cabin Pressure Control System - Fault Isolation
21-31-01	Cabin Pressure Control Panel - Removal and Installation
21-31-02	Cabin Pressure Controller - Removal and Installation
21-32-01	Cabin Safety Valve - Adjustment and Test
34-14-01	Air Data Computer - Removal and Installation
34-13-03	Standby Altimeter - Removal and Installation
34-13-04	Standby Airspeed Indicator - Removal and Installation
21-33-00	Standby Cabin Altimeter - Removal and Installation
21-31-51	Outflow Valve Actuator - Removal and Installation
24-00-00	Electrical Power System - Maintenance Practices
36-00-00	Pneumatic System - Maintenance Practices
49-00-00	APU - Maintenance Practices

4. Maintenance Practices

A. Safety Precautions

(1) A minimum of 2 people should be in aircraft fuselage while fuselage is pressurized. Personnel shall not engage in pressurization if afflicted with head cold, asthma, or bronchial troubles.

(2) Voice communications must be maintained between personnel inside the fuselage and personnel operating the ground air source.

(3) The rate of descent (compression) should not exceed 1500 feet per minute (fpm) as indicated on the FE/SO cabin rate of climb indicator. The rate of climb (decompression) should not exceed 2000 feet per minute (fpm) as indicated on the cabin rate of climb indicator.

NOTE: Rate of descent and rate of climb is at comfort of personnel (normally 500 fpm).

(4) Personnel subjected to compression and decompression during this test should not fly for 18 hours after completion of test.

(5) All normally installed equipment that vents to outside should be in the configuration of Table 201.

Normal Vent Configuration
Table 201

	ITEM	CONDITION
R	Lavatory vents (forward and aft)	normal
	Cabin pressure outflow valves (2)	open
	Cabin pressure safety valves (2)	normal (closed)
	Cabin negative pressure relief valves (2)	normal (closed)
	*FESC cooling system exhaust valve	closed
	*MESC cooling system exhaust valve	closed
	Water drain systems (3)	normal

Normal Vent Configuration (Cont)
Table 201

ITEM	CONDITION
*Galley exhaust valve (1)	closed
Potable water heating	normal (open)

*Closed by releasing COOL AIR OVBD switchlight on the FE/SO ECS MONITOR panel

(6) Aircraft should not be pressurized when supported by jacks. It is recommended that jacks be clear of jack pads by a radius distance of 12 inches.

(7) Cabin Safety Valves must be operational (Ref. 21-32-01).

CAUTION: DO NOT MANUALLY PRESSURIZE CABIN TO PRESSURE GREATER THAN THAT OBTAINED AT -1000 FT CABIN ALTITUDE. TO DO SO WILL DAMAGE THE CABIN ALTIMETER AND DIFFERENTIAL PRESSURE INDICATORS. AIR DATA COMPUTERS, STANDBY ALTIMETER, CABIN PRESSURE CONTROLLER AND AIRSPEED INDICATORS WILL BE DAMAGED IF THESE UNITS ARE DISCONNECTED FROM THE AIRCRAFT PLUMBING.

C C C C NOTE: If it is necessary to pressurize the aircraft cabin greater than -1000 feet, remove the following components prior to pressurization, or ensure no pitot/static leaks exist. Cabin altimeter must be removed from aircraft.

Components To Be Removed
Table 202

	ITEM	LOCATION/PANEL
R	Cabin Altitude Indicator	FE/SO Instrument Panel
	Pitot Boom Covers (4)	Exterior Surface Aft of Radome

NOTE: The following components can withstand a pressure of 24 PSIA and need not be removed provided these units are not disconnected from the aircraft plumbing.

Standby Altimeter (Ref. 34-13-03)	Center Instrument Panel
Airspeed Indicators (2) (Ref. 34-14-04)	Pilots Instrument Panel

Components To Be Removed (Cont)
Table 202

ITEM	LOCATION/PANEL
Standby Air Speed Indicator (Ref. 34-13-04)	Center Instrument Panel
Cabin Pressure Controller (Ref. 21-31-02)	Fwd Electronic Service Center
Air Data Computers (2) (Ref. 34-14-01)	Fwd Electronic Service Center

B. Basic Setup

C (1) DELETED.

(2) Connect ground air start lines to aircraft or start APU.

CAUTION: ALL DOORS AND OTHER OPENINGS THAT DEPEND ON MECHANICAL SEALS FOR PRESSURE TIGHTNESS MUST BE CLOSED IN A NORMAL MANNER.

(3) Verify all doors are closed and locks are secured except door used for entrance to aircraft for pressurization.

WARNING: ENSURE THAT ALL PERSONNEL OUTSIDE OF AIRCRAFT KEEP CLEAR OF CARGO DOORS.

(4) After all cargo doors are closed and locked, on galley left circuit breaker panel, open and tag circuit breakers:

CARGO DOOR - CONTROL - FWD (C19)

CARGO DOOR - CONTROL - CTR (C20)

CARGO DOOR - CONTROL - AFT (C21)

CR CR (5) Open oxygen circuit breakers - CB1J15, CB1J16, CB1J17, CB1J18.

R (6) Verify vent configuration (Ref. Table 201).

R (7) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

CABIN PRESSURE CONT - AUTO - PWR (X10),

CABIN PRESSURE CONT = STBY = PWR (X12).

C. Pressurization Procedures

(1) With required personnel aboard aircraft and all doors closed and secured, proceed with the following procedure.

(2) Establish pneumatics and air conditioning, two packs minimum (Ref. 21-00-00).

(3) On FE/SO CABIN PRESSURE CONTROL panel, zone 215, perform the following steps:

(a) Select manual pressurization mode by latching in both FWD and AFT MANUAL switchlights and verify both MNL legends are illuminated.

(b) Close the aft outflow valve using the AFT OPEN - CLOSE toggle switch.

WARNING: DO NOT EXCEED A DESCENT RATE OF 1500 FPM WHILE PRESSURIZING THE FUSELAGE.

(c) On FE/SO CABIN PRESSURE CONTROL panel, monitor the cabin rate of climb indicator to establish a normal 500 fpm rate of descent by slowly modulating the forward outflow valve toward closed position using the FWD OPEN - CLOSE toggle switch. When 8.25 psi differential pressure is reached, reduce rate of descent to 300 fpm. Slowly increase differential pressure to the normal maximum differential of 8.44 psi.

NOTE: If difficulty is experienced in maintaining a cabin rate of descent at high differential pressures, pack flows can be increased by selecting pack temperature control manual warm and monitor pack temperatures to prevent a pack overheat trip.

WARNING: DURING THE SAFETY VALVE CHECK ENSURE THAT OBSERVER STANDS CLEAR OF VALVE EXHAUST.

CAUTION: DO NOT EXCEED A PRESSURE DIFFERENTIAL OF 8.80 PSI.

(4) If safety valves are to be checked, station an observer outside aircraft adjacent to safety valves but not directly in line with valve exhaust. On the FE/SO CABIN PRESSURE CONTROL panel, slowly increase differential pressure until safety valves open at

differential pressure of 8.70-8.80 psi and the FWD and AFT safety valve OPEN lights illuminate.

NOTE: If only one valve operates and prevents further increases in differential pressure, proceed to Step 4C(6) and depressurize fuselage. Deactivate the valve that has operated as specified in 21-32-01. Then repeat pressurization procedure to check the remaining safety valve operation.

(5) On pilots center instrument panel, verify ECS light flashes for 10 seconds and then remains on.

WARNING: DO NOT EXCEED 2000 FPM RATE OF CLIMB WHEN DEPRESSURIZING THE FUSELAGE.

(6) When pressurization check is complete, perform the following steps:

(a) On FE/SO CABIN PRESSURE CONTROL panel, monitor the cabin rate of climb indicator and establish a normal 500-800 fpm rate of climb by slowly modulating the forward outflow valve toward open position using the FWD OPEN - CLOSE toggle switch.

(b) Verify that safety valves are fully closed by 8.62 psi differential pressure.

(c) Verify both FWD and AFT safety valve OPEN lights are off.

(d) On pilots center instrument panel, verify ECS light is off.

(7) When cabin is completely depressurized, perform the following steps:

(a) On FE/SO CABIN PRESSURE CONTROL panel, zone 215, open aft outflow valve using AFT OPEN - CLOSE toggle switch.

(b) When both forward and aft outflow valves are full open, operate air conditioning as required (Ref. 21-00-00,201).

(c) On FE/SO CABIN PRESSURE CONTROL panel, unlatch both FWD and AFT MANUAL switchlights and verify both MNL legends are off.

CR CR (8) Close circuit breakers opened in Steps 4B(4), 4B(5), and 4B(7).

(9) Reseat safety valve flapper plates on aircraft exterior, forward of the forward cargo compartment door.

CR (10) Install cabin altitude indicator.

CABIN PRESSURE CONTROL SYSTEM - ADJUSTMENT AND TEST

1. General

No cabin pressure control system adjustments are required. Four system operational tests are available:

A. A system component and circuit test, using built-in test equipment (BITE). BITE system controls and indicator lights are on the front panel of the cabin pressure controller in the forw rd electronic service center (FESC), zone 112.

B. A ground check procedure, without cabin pressurization, using controls and indicators on the Flight Engineer/Second Officer (FE/SO) CABIN PRESSURE CONTROL panel, zone 215. This test should follow the BITE system test.

C. A ground check procedure, including cabin pressurization, using controls and indicators on the Flight Engineer/Second Officers CABIN PRESSURE CONTROL panel, zone 215. This test must not be performed without first performing the preceding ground check procedure without cabin pressurization. If malfunction is suspected the BITE system test should be the first test performed.

CR CR CR D. A fuselage pressurization and hull leakage procedure to be used in order to locate a hull leak for an in-flight pilot remark. This procedure operates the cabin pressure control system to the maximum differential pressure. This procedure must not be performed unless the preceding ground checks have been completed successfully.

R WARNING: DUE TO THE LARGE VOLUME OF THE FUSELAGE, A POTENTIALLY DANGEROUS CONDITION IS CREATED WHENEVER THE FUSELAGE IS PRESSURIZED. THEREFORE, EXTREME CARE SHOULD BE TAKEN IN FOLLOWING THIS PROCEDURE AND ITS SAFETY PRECAUTIONS.

CR 2. Equipment and Materials

CR Deleted.

3. Referenced Procedures

21-00-00 Air Conditioning - Maintenance Practices

21-31-00 Cabin Pressure Control - Fault Isolation

21-31-01	Cabin Pressure Control Panel - Removal and Installation
21-31-02	Cabin Pressure Controller - Removal and Installation
21-31-51	Outflow Valve Actuator - Removal and Installation
21-32-01	Cabin Safety Valve - Adjustment and Test
21-33-01	Cabin Differential Pressure Indicator - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices
34-13-03	Standby Altimeter - Removal and Installation
34-13-04	Standby Airspeed Indicator - Removal and Installation
34-14-01	Air Data Computer - Removal and Installation
36-00-00	Pneumatic System - Maintenance Practices
49-00-00	Airborne Auxiliary Power - Maintenance Practices

4. Adjustment/Test

WARNING: TAG FORWARD AND AFT OUTFLOW VALVES TO KEEP PERSONNEL CLEAR OF OUTFLOW VALVES DURING ANY OF THE FOLLOWING TESTS.

A. Operational Test - BITE System

(1) Verify the following circuit breakers are closed:

On pilot overhead circuit breaker panel CB1, zone 210:

ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - FWD (H1),

ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - AFT (H2).

On Flight Engineer/Second Officer aft circuit breaker panel CB3, zone 215:

CABIN PRESSURE CONT - AUTO - CONT (X9),

CABIN PRESSURE CONT - AUTO - PWR (X10),

CABIN PRESSURE CONT - STBY - CONT (X11),

CABIN PRESSURE CONT - STBY - PWR (X12)

OUTFLOW VALVE - FWD (X14),

OUTFLOW VALVE - AFT (X17).

(2) Turn on electrical power (Ref. 24-00-00).

(3) On Flight Engineer/Second Officer CABIN PRESSURE CONTROL panel, zone 215, note control/selector positions, then position the control/selectors as follows:

ALT SET - 7000 feet

BARO SET - 29.92 in. Hg (1013 mb)

MODE SEL - NORM

NORM RATE - at "pip"

STBY RATE - HOLD

FWD - MNL (switchlight) - Off (out)

AFT - MNL (switchlight) - Off (out)

(4) On same panel, verify MNL lights (in switchlights) are off, FAULT light is off, and that FWD and AFT outflow valve position indicators indicate that both outflow valves are full open.

(5) Open FESC access door 112AB.

(6) In FESC, use controls and indicator lights on cabin pressure controller front panel to perform the following Steps 4A(7) through 4A(10) for each of positions 2 through 11 on the test selector switch:

(7) Depress and hold PUSH TO TEST switch.

(8) TEST IN PROGRESS light must come on for approximately 6 seconds, then go off.

(9) When TEST IN PROGRESS light goes off, either the GO or the NO GO light must come on.

(10) Release PUSH TO TEST switch. Light must go off.

(11) If GO light came on, move test selector switch clockwise to next test position and repeat Steps 4A(7) through 4A(11) for next switch position.

(12) If NO GO light came on, discontinue test and replace indicated faulty line replaceable unit (LRU).

NOTE: LRU names are abbreviated at test selector switch positions as follows:

C - Controller, positions 2 and 6 (Ref. 21-31-02).

CP - Control Panel, positions 3, 4, 5, and 6 (Ref. 21-31-01).

FA - Forward Outflow Valve Actuator, positions 8 and 10 (Ref. 21-31-51).

AA - Aft Outflow Valve Actuator, positions 9 and 11 (Ref. 21-31-51).

(13) After faulty LRU has been replaced, resume test at lowest numbered test selector switch position for that component. If NO GO light comes on again, use pertinent fault isolation procedure (Ref. 21-31-00).

(14) Continue test, repeating Steps 4A(7) through 4A(11) at each test selector switch position, until a GO light has been obtained at every test position.

(15) Place test selector switch at OFF - FLIGHT POSITION.

(16) Return all control/selectors to pre-test positions noted in Step 4A(3).

(17) Turn off electrical power (Ref. 24-00-00).

B. Operational Test - Ground Check Without Cabin Pressurization

This test verifies satisfactory system operation only to that extent possible without cabin pressurization or in-flight conditions. The Operational Test - BITE System (Para. 4A) provides a check of functions not tested in this procedure.

If the following test procedure indicates a malfunction not found during the BITE system procedure perform pertinent FAULT Isolation procedures as necessary (Ref. 21-31-00).

(1) Preparation

(a) Verify circuit breakers listed in Step 4A(1) are closed.

(b) Turn on electrical power (Ref. 24-00-00).

(c) On Flight Engineer/Second Officers CABIN PRESSURE CONTROL panel, zone 215, note control/selector positions, then position the control/selectors as follows:

ALT SET - 500 feet above field altitude

BARO SET - Existing field barometric pressure

MODE SEL - NORM

NORM RATE - at "pip"

STBY RATE - HOLD

FWD - MNL (switchlight) - Off (out)

AFT - MNL (switchlight) - Off (out)

(d) On same panel, verify MNL lights (in switchlights) are off, FAULT light is off, and FWD and AFT outflow valve position indicators indicate both outflow valves are full open.

(2) Normal-Ground Checkout

(a) Move MODE SEL selector to GND CHK.

(b) Verify both outflow valves remain open.

(c) Return MODE SEL selector to NORM.

(d) Adjust ALT SET selector for a cabin altitude 500 feet below field altitude.

(e) Move MODE SEL selector to GND CHK.

(f) Verify both outflow valves start closing at the same time, that forward outflow valve pauses at indicator "pip" mark until aft outflow valve is fully closed, and that the forward outflow valve then moves to fully closed.

(g) Adjust ALT SET selector for cabin altitude the same as field altitude.

(h) Verify both outflow valves begin opening when cabin altitude is same as field altitude ±120 feet. Allow valves to fully open and leave ALT SET selector at point valves started opening.

(i) Adjust BARO SET selector to 0.2 in. Hg, or 6.5 mb, higher barometric pressure (for example: move from 29.9 to 30.1 in. Hg or from 1013 to 1019.5 mb).

(j) Verify both outflow valves close, as in Step 3B(2)(f).

(k) Adjust BARO SET selector to existing field barometric pressure, the same as before Step 4B(2)(i).

(l) Verify both outflow valves open.

(m) Adjust ALT SET selector for cabin altitude 150 feet below altitude selected in Step 4B(2)(h).

(n) Verify both outflow valves close, as in Step 4B(2)(f).

(o) Adjust BARO SET selector to 0.2 in. Hg, or 6.5 mb, lower barometric pressure (for example: move from 29.9 to 29.7 in. Hg or 1013 to 1006.5 mb).

(p) Verify both outflow valves open.

(q) Adjust BARO SET to existing field barometric pressure, same as before Step 4B(2)(i).

(r) Verify both outflow valves close as in Step 4B(2)(f).

(s) Set MODE SEL selector to NORM.

(t) Verify both outflow valves open.

(u) If test is to be terminated proceed to conclusion Step 3B(5).

(3) Standby Mode

(a) Verify STBY RATE control is set to HOLD and set MODE SEL selector to STBY.

NOTE: Outflow valves may remain open or may begin to close because of STBY RATE control positioning at HOLD index.

(b) Set STBY RATE control to DSCD.

(c) Verify both outflow valves close as in Step 4B(2)(f).

(d) Set STBY RATE control to left edge of HOLD index.

(e) Verify both outflow valves remain closed.

(f) Set STBY RATE control to ASCD.

(g) Verify both outflow valves open.

(h) Set STBY RATE control to right edge of HOLD index.

(i) Verify both outflow valves remain open.

(j) If test is to be terminated proceed to conclusion Step 4B(5).

(4) Manual Mode

(a) Press FWD - MNL switchlight (latched in).

(b) Verify MNL light in switchlight comes on, and that ECS light in pilots caution and warning annunciator panel flashes on and off for approximately 10 seconds, then remains on.

(c) Hold FWD OPEN/CLOSED toggle switch in CLOSED position.

(d) Verify forward outflow valve moves toward closed. Release toggle switch and verify valve movement stops, then run valve fully closed.

(e) Hold FWD OPEN/CLOSED toggle switch in OPEN position.

(f) Verify forward outflow valves moves toward open. Release toggle switch and verify valve movement stops.

(g) Release FWD - MNL switchlight to off (out) position.

(h) Verify MNL light in switchlight and ECS light on pilots caution and warning annunciator panel both go off.

(i) Verify forward outflow valve moves to the full open position.

(j) Repeat Steps 4B(4)(a) through 4B(4)(i) for aft outflow valve, using AFT - MNL switchlight and AFT OPEN/CLOSED toggle switch.

(5) Conclusion

(a) Return all control/selectors to pre-test positions noted in Step 4B(3).

(b) Turn off electrical power (Ref. 24-00-00).

C. Operational Test - Ground Check With Cabin Pressurization

This test may be performed without running the propulsion engines, by using either a high pressure ground air source (Ref. 36-13-00) or the Airborne Auxiliary Power Unit (Ref. 49-00-00). Before beginning this test perform Operational Test - BITE System (Para. 4A) and Operational Test - Ground Check Without Cabin Pressurization (Para. 4B), to verify system integrity.

This test verifies satisfactory system operation to that extent possible without in-flight conditions. Cabin pressure must be limited to that obtained with a -1000 ft cabin altitude selection, to avoid damage to equipment with pressure sensing elements.

If a malfunction is detected during test, immediately discontinue test and perform Fault Isolation procedures (Ref. 21-31-00) as necessary to correct malfunction.

R WARNING: CABIN PRESSURIZATION TEST MUST BE PERFORMED ONLY BY FULLY QUALIFIED PERSONNEL. ALL STANDARD SAFETY PRECAUTIONS MUST BE CAREFULLY OBSERVED.

C CAUTION: DO NOT MANUALLY PRESSURIZE CABIN TO PRESSURE GREATER THAN THAT OBTAINED AT -1000 FT CABIN ALTITUDE. TO DO SO WILL DAMAGE THE CABIN ALTIMETER. AIR DATA COMPUTERS, STANDBY ALTIMETER, CABIN PRESSURE CONTROLLER AND AIRSPEED INDICATORS WILL BE DAMAGED IF THESE UNITS ARE DISCONNECTED FROM THE AIRCRAFT PLUMBING.

C NOTE: If it is necessary to pressurize the aircraft cabin greater than -1000 feet below field elevation, the cabin altimeter indicator must be removed from the aircraft. Air data computers, Cabin Pressure Controller, Standby Altimeter and Airspeed Indicators can withstand a pressure of 24 psia as long as these units are not disconnected from aircraft plumbing.

(1) Verify the following circuit breakers are closed:

On pilot overhead circuit breaker panel CB1, zone 210:

ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - FWD (H1),

ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - AFT (H2),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5),

ENVIR CONTROL SYSTEM - PACK - HI FLOW - CONT (H6),

AIR - OVBD (J14),

ENGINE BLEED CONTROL - ENG ISLN VAVLES - 1 (G10),

ENGINE BLEED CONTROL - ENG ISLN VALVES - 2 (G11),

ENGINE BLEED CONTROL - ENG ISLN VALVES - 3 (G12),

ENGINE BLEED CONTROL - HI PRESSURE VALVES - 1 (G13),

ENGINE BLEED CONTROL - HI PRESSURE VALVES - 2 (G14),

ENGINE BLEED CONTROL - HI PRESSURE VALVES - 3 (G15).

On Flight Engineer/Second Officer overhead circuit breaker panel CB2, zone 215:

GROUND SERVICE - AVIONICS - AIR - MON (L5),

GROUND SERVICE - BAT - CHG - INTLK (L6),

WING - ANTI-ICE - CONT (D22)

LAV - JET - PUMP (A4).

On Flight Engineer/Second Officer aft circuit breaker panel CB3, zone 215:

CABIN PRESSURE CONT - AUTO - CONT (X9),

CABIN PRESSURE CONT - AUTO - PWR (X10),

CABIN PRESSURE CONT - STBY - CONT (X11),

CABIN PRESSURE CONT - STBY - PWR (X12),

OUTFLOW VALVE - FWD (X14),

OUTFLOW VALVE - AFT (X17),

HOT AIR MANF - IND (W5),

HOT AIR MANF - TEMP - CONT (W6),

HOT AIR MANF - ISLN - NO. 2 (W7),

HOT AIR MANF - ISLN - NO. 3 (W8),

CARGO TEMP - FWD - MID (W9),

CARGO TEMP - AFT (W10),

FLOOR HEAT - CONT (W11),

FLOOR HEAT - PWR (W12),

DUCT AREA - OVHT DET - DC (W13),

DUCT AREA - OVHT DET - AC (W14),

ECS - AIR TEMP - IND (V1),

PACK - FLOW - IND (V2),

TEMP CONT - FLT STA - DC (V3),

TEMP CONT - FLT STA - AC (V4),,

PACK 1 - AUTO/MAN - DC (V5),

PACK 1 - AUTO/MAN - AC (V6),

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - DC (V9),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V11),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - AC (V12),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - DC (V13),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16),

PACK 3 - AUTO/MAN - DC (V17),

PACK 3 - AUTO/MAN - AC (V18),

BLEED - AIR - IND (R17),

ECS - IND - LT (G12).

On galley left circuit breaker panel, zone 130:

FAN - AVIONICS - RACK - MAIN (14D)

COMPT FAN - GALLEY (11C)

On galley right circuit breaker panel, zone 130:

HEATERS - JET PUMP - LAV (3A)

FWD AVIONICS - FAN (14E)

(2) Turn on electrical power (Ref. 24-00-00).

(3) On Flight Engineer/Second Officer CABIN PRESSURE CONTROL panel, zone 215, note control/selector positions, then position the control/selectors as follows:

ALT SET - 500 feet above field altitude

BARO SET - Existing field barometric pressure

MODE SEL - NORM

NORM RATE - at "pip"

STBY RATE - HOLD

FWD - MNL (switchlight) - Off (out)

AFT - MNL (switchlight) - Off (out)

(4) On same panel, verify MNL lights (in switchlights) are off, FAULT light is off, and FWD and AFT outflow valve position indicators indicate both outflow valves are full open.

(5) On panel above CABIN PRESSURE CONTROL panel, set cabin altimeter for existing field barometric pressure.

(6) On same panel, verify SAFETY VALVE FWD and AFT OPEN lights are off, and cabin rate of change and cabin differential pressure indicators indicate "0".

(7) Outside airplane, visually verify both outflow valves are full open.

(8) Verify all cabin pressure bearing access panels are closed, including two in forward pressure bulkhead (111BZ and 111CZ) and three in canted bulkhead at forward end of nose wheel well (113CZ, 113DZ, and 113EZ).

(9) Close and secure forward electronic and mid electrical service center doors.

(10) Close and secure three cargo compartment doors and galley service door.

R WARNING: AFTER ALL CARGO DOORS ARE CLOSED AND LOCKED, OPEN
R AND TAG CARGO DOOR CONTROL FWD, CTR, AND AFT
R CIRCUIT BREAKERS.

(11) On galley left circuit breaker panel zone 130, open and tag the following circuit breakers:

CARGO DOOR - ACTUATOR - FWD (14C),

CARGO DOOR - CONTROL - FWD (19C),

CARGO DOOR - ACTUATOR - CTR (17C),

CARGO DOOR - CONTROL - CTR (20C),

CARGO - DOOR - ACTR - AFT (19D),

CARGO DOOR - CONTROL - AFT (21C).

WARNING: KEEP CARGO DOORS CLEAR OF PERSONNEL. CARGO DOORS MUST NOT BE OPENED WHEN THE AIRCRAFT IS PRESSURIZED.

(12) Verify flight compartment hatch is closed and secured.

(13) Close and secure all passenger doors, including emergency door.

(14) On Flight Engineer/Second Officer ENGINE BLEED. CONTROL/CABIN TEMP CONTROL panel, zone 215, set system controls/selectors as required for bleed air system operation (Ref. 36-00-00) and cabin temperature control system operation (Ref. 21-00-00).

(15) Connect and start high pressure ground air source (Ref. 36-13-00) or start auxiliary power unit (Ref. 49-00-00).

(16) On panel above CABIN PRESSURE CONTROL panel, verify cabin differential pressure is less than 0.15 psi.

(17) Verify satisfactory bleed air system and cabin temperature control system operation before proceeding with cabin pressure control system test (Ref. 36-00-00 and 21-00-00).

C C (18) On CABIN PRESSURE CONTROL panel, adjust ALT SET selector for -1000 ft below field elevation.

(19) Verify both outflow valves remain open.

(20) Move MODE SEL selector to GND CHK.

R (21) Verify the following:

Both outflow valves start closing.

R R Cabin rate of change indicator indicates between 150 and 550 fpm DOWN.

Cabin altimeter indicates decreasing altitude.

Cabin differential pressure indicator indicates increasing pressure.

(22) Test NORM RATE selector operation by adjusting for minimum rate (approximately 120 fpm DOWN on indicator) and toward INCR (above "pip") for approximately 500 fpm DOWN indication, then return selector to "pip" position.

(23) When cabin pressure stabilizes, as indicated by cabin rate of change indicator indicating "0", verify that:

C Cabin altimeter indicates approximately 1000 feet
C below field elevation.

Cabin differential pressure indicator indicates 0.5 psi or more, depending upon field altitude.

Cabin outflow valves are at approximately same position.

(24) Adjust BARO SET selector to 0.1 in. Hg higher barometric pressure.

(25) Verify cabin rate of change indicator indicates DOWN.

(26) Return BARO SET selector to existing field barometric pressure.

(27) Verify cabin rate of change indicator indicates UP. Allow cabin pressure to again stabilize (indicator returning to "0").

C (28) Adjust ALT SERT Selector to -500 FT. below field
C elevation.

(29) Verify cabin rate of change indicator indicates UP and that cabin altimeter and cabin differential pressure indicate decreasing cabin pressure. Again allow cabin pressure to stabilize.

(30) Move MODE SEL selector from GND CHK selection to STBY selection.

(31) Adjust STBY RATE selector toward DSCD.

C CAUTION: DO NOT EXCEED -1000 FT below field elevator.

(32) Verify cabin rate of change indicator indicates DOWN and cabin altimeter indicates decreasing altitude.

(33) Adjust STBY RATE selector toward ASCD.

(34) Verify cabin rate of change indicator indicates UP and cabin altimeter indicates increasing altitude.

C (35) Adjust STBY RATE Selector to HOLD to obtain zero rate
C of change when cabin altimeter indicates approximately
C 500 feet below field elevation.

(36) Move MODE SEL selector from STBY selection to GND CHK selection and again allow cabin pressure to stabilize.

(37) Depress FWD - MNL switchlight.

(38) Verify MNL light in switchlight comes on, and ECS light in pilots caution and warning annunciator panel flashes on and off for approximately 10 seconds, then remains on.

(39) Momentarily hold the FWD OPEN/CLOSED toggle switch in CLOSED position.

(40) Verify forward outflow valve moves toward closed, cabin rate of change indicator indicates DOWN, and other outflow valve moves toward open.

(41) Move toggle switch to OPEN position.

(42) Verify forward outflow valve moves toward open, cabin rate of change indicator indicates UP, and other outflow valve moves toward closed.

(43) Release toggle switch and allow cabin pressure to stabilize (outflow valves will be at different positions).

(44) Release FWD - MNL switchlight to off (out) position.

(45) Verify MNL light in switchlight and ECS light on pilots caution and warning annunciator panel both go off.

(46) Verify that forward and aft outflow valves move to approximately the same positions.

(47) Repeat Steps 4C(37) through 4C(46) for aft outflow valve, using AFT - MNL switchlight and AFT OPEN/CLOSED toggle switch.

(48) Allow cabin pressure to again stabilize.

(49) Move MODE SEL selector to NORM.

(50) Verify the following:

Both outflow valves start opening.

Cabin Rate of Change indicator indicates between 400 and 850 fpm UP.

Cabin altimeter indicates increasing altitude.

Cabin differential pressure indicator indicates decreasing pressure.

(51) When cabin rate of change indicator indicates "0" verify the following:

Both outflow valves are full open.

Cabin altimeter indicates no more than 250 feet below field altitude.

Cabin differential pressure indicator indicates less than 0.15 psi.

(52) Turn off high pressure ground air source (Ref. 36-13-00) or auxiliary power unit (Ref. 49-00-00), whichever has been used.

(53) Return all controls/selectors to pre-test positions.

(54) Open passenger and other doors as needed.

(55) Turn off electrical power (Ref. 24-00-00).

C D. Field Hull Leak Check - Pressurization Flight Reports

C This test may be performed, by using a high pressure ground air source (Ref. 36-13-00) or by using the Airborne Auxiliary Power Unit (Ref. 49-00-00). Before beginning this test perform Operational Test - BITE System (Para. 4A) and Operational Test - Ground Check Without Cabin Pressurization (Para. 4B), to verify system integrity.

This test verifies satisfactory system operation and fuselage sealing to that extent possible without in-flight conditions. If a malfunction is detected during test, immediately discontinue test and perform Fault Isolation procedures (Ref. 21-31-00) as necessary to correct malfunction.

WARNING: CABIN PRESSURIZATION TEST MUST BE PERFORMED ONLY BY FULLY QUALIFIED PERSONNEL. ALL STANDARD SAFETY PRECAUTIONS MUST BE CAREFULLY OBSERVED.

MINIMUM OF 2 PEOPLE, WILL REMAIN IN AIRCRAFT FUSELAGE WHILE FUSELAGE IS PRESSURIZED. PERSONNEL SHALL NOT ENGAGE IN PRESSURIZATION IF AFFLICTED WITH HEAD COLD, ASTHMA, OR BRONCHIAL TROUBLES.

Voice communications must be maintained between personnel inside the fuselage and personnel operating the ground air source.

The air pressure rate applied to fuselage under pressure should not exceed 1500 ft/min max as indicated on the FE/SO cabin rate of c.imb indicator. The rate of decompression should not exceed 2000 ft/min max as indicated on the cabin rate of climb indicator.

NOTE: Rate of climb and rate of decompression is at comfort of personnel (normally 500 FPM). Aircraft shall not be pressurized when supported by jacks. It is recommended that jacks be clear of jack pads by a radius distance of 12 inches.

C Remove the following indicator 5 from the aircraft and cap
C aircraft pitot-static lines: Cabin altimeter.

C NOTE: At start of hull pressurization monitor pitot-static
C instruments for movement. Any movement is an
C indication of a pitot-static leak. Pitot-static
C leaks must be corrected prior to continuing this
C check.

C (2) DELETED

(3) Connect external electrical power, energize buses, and verify that the following circuit breakers are closed:

On pilot overhead circuit breaker panel CB1, zone 210:

ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONTROL - FWD (H1),

ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONTROL - AFT (H2),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5),

ENVIR CONTROL SYSTEM - PACK - HI FLOW - CONT (H6),

AIR - OVBD (J14),

ENGINE BLEED CONTROL - ENG ISLN VALVES - ENG - 1 (G10),

ENGINE BLEED CONTROL - ENG ISLN VALVES - ENG - 2 (G11),

ENGINE BLEED CONTROL - ENG ISLN VALVES - ENG - 3 (G12),

ENGINE BLEED CONTROL - HI PRESS VALVES - ENG - 1 (G13),

ENGINE BLEED CONTROL - HI PRESS VALVES - ENG - 2 (G14),

ENGINE BLEED CONTROL - HI PRESS VALVES - ENG - 3 (G15).

On Flight Engineer/Second Officer overhead circuit breaker panel CB2, zone 215:

GROUND SERVICE - AVIONICS - AIR - MON (L5),

GROUND SERVICE - BAT - CHG - INTLK (L6),

WING - ANTI-ICE - CONT (D22),

LAV - JET - PUMP (A4).

On Flight Engineer/Second Officer aft circuit breaker panel CB3, zone 215:

CABIN PRESSURE CONT - AUTO - CONT (X9),

CABIN PRESSURE CONT - AUTO - PWR (X10),

CABIN PRESSURE CONT - STBY - CONT (X11),

CABIN PRESSURE CONT - STBY - PWR (X12),

OUTFLOW VALVE - FWD (X14),

OUTFLOW VALVE - AFT (X17),

HOT AIR MANF - IND (W5),

HOT AIR MANF - TEMP - CONT (W6),

HOT AIR MANF - ISLN - NO. 2 (W7),

HOT AIR MANF - ISLN - NO. 3 (W8),

CARGO TEMP - FWD - MID (W9),

CARGO TEMP - AFT (W10),

FLOOR HEAT - CONT (W11),

FLOOR HEAT - PWR (W12),

R DUCT AREA - OVHT DET - DC (W13),

DUCT AREA - OVHT DET - AC (W14),

ECS - AIR TEMP - IND (V1),

PACK - FLOW - IND (V2),

TEMP CONT - FLT STA - DC (V3),

TEMP CONT - FLT STA - AC (V4),

PACK 1 - AUTO/MAN - DC (V5),

PACK 1 - AUTO/MAN - AC (V6),

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - DC (V9),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V11),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - AC (V12),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - DC (V13),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16),

PACK 3 - AUTO/MAN - DC (V17),

PACK 3 - AUTO/MAN - AC (V18),

BLEED - AIR - IND (R17),

ECS - IND - LT (G12).

On galley left circuit breaker panel, zone 103:

FAN - AVIONICS RACK - MAIN (14D),

COMPT FAN - GALLEY (11C),

On galley right circuit breaker panel, zone 130:

HEATERS - JET PUMP - LAV (3A)

FWD AVIONICS - FAN (14E)

CAUTION: IF THE APU IS OPERATED IT MUST BE OPERATED BY AUTHORIZED PERSONNEL ONLY AND IN ACCORDANCE WITH NORMAL APU GROUND OPERATING PROCEDURE (REF. 49-00-00).

(4) Connect ground air start lines to aircraft or start APU.

NOTE: Fuselage Isolation Valve (aft) must be opened when auxiliary power unit is used to supply high pressure air.

WARNING: ALL DOORS AND OTHER OPENINGS THAT DEPEND ON MECHANICAL SEALS FOR PRESSURE TIGHTNESS SHALL BE CLOSED IN A NORMAL MANNER. THERE MUST BE NO TEMPORARY CLAMPS CLOSURE STRIPS, OR SEALANTS APPLIED NOR ADJUSTMENTS MADE TO DOOR SEALS AFTER NORMAL CLOSING OF DOORS AND DURING PRESSURIZATION.

ON GALLEY LEFT CIRCUIT BREAKER PANEL, ZONE 130.

ENSURE THAT ALL PERSONNEL OUTSIDE OF AIRCRAFT KEEP CLEAR OF CARGO DOORS.

(5) Verify all doors are closed and locks are secured.

(6) Verify that following valves are closed:

Engine Isolation Valves (3)

Wing Anti-Ice Valves (2)

*Forward Electronic Service Center Exhaust Valve

*Galley Exhaust Valve

*Mid Electrical Service Center Exhaust Valve

Air Turbine Motor Air Control Valve (2)

Auxiliary Power Unit Shutoff Valve

NOTE: *Closed by unlatching COOL AIR OVBD switchlight on FE/SO ECS MONITOR panel.

(7) Verify that following valves are open:

*Crossbleed Duct Isolation Valves (2)

*Pack Flow Control Valves (3)

Outflow Valves (2)

**Zone Trim Valves (5)

*Hot Air Control Valves (2)

*Hot Air Manifold Isolation Valves (2)

Turbine Bypass Valves (3)

NOTE: *Valves require airflow to open.

**Set zone controls to full warm to open.

C (8) DELETED.

(9) Start high pressure air source and turn on air conditioning, two packs minimum (Ref. 21-00-00, 36-00-00 and 49-00-00). Allow pneumatic and airconditioning systems operation to stabilize and verify satisfactory operation.

(10) Depress FWD and AFT MANUAL switchlights on Cabin Pressure Control panel. Verify MNL lights come on.

(11) Using AFT MANUAL outflow toggle switch close the AFT outflow valve.

(12) Slowly modulate the FWD toggle switch on CABIN PRESSURE CONTROL panel toward the closed position.

(13) Monitor the cabin rate of climb indicator for a rate of decent of 500 fpm normally.

WARNING: DO NOT EXCEED 1500 FPM RATE OF DECENT.

C DO NOT EXCEED A PRESSURE DIFFERENTIAL OF 3.00 PSI.

(14) Verify that all sill drain valves close at a fuselage pressure differential of 4.08 to 5.1 in. Hg (2.0 to 2.5 psi) (53-15-00).

C (15) Check for hull leaks at the following locations:

C (a) Left and right air conditioning bays

C (b) All passenger and cargo doors

C (c) F.E.S.C. and MESC access doors

C (d) Aft bulkhead - APU duct to fuselage seal (Sta.
C 1839)

C (e) Lt. ATM area - APV duct to fuselage seal (Sta.
C 1354)

C (f) Crossbleed manifold - pack input ducts to fuselage
C seals (Sta. 993)

C (g) Negative pressure relief valves - aft bulkhead

C (h) Flight deck and cabin windows

C (16)-(19) DELETED

(20) When leakage check is complete, slowly modulate the cabin manual pressure switches on the CABIN PRESSURE CONTROL panel toward the OPEN position.

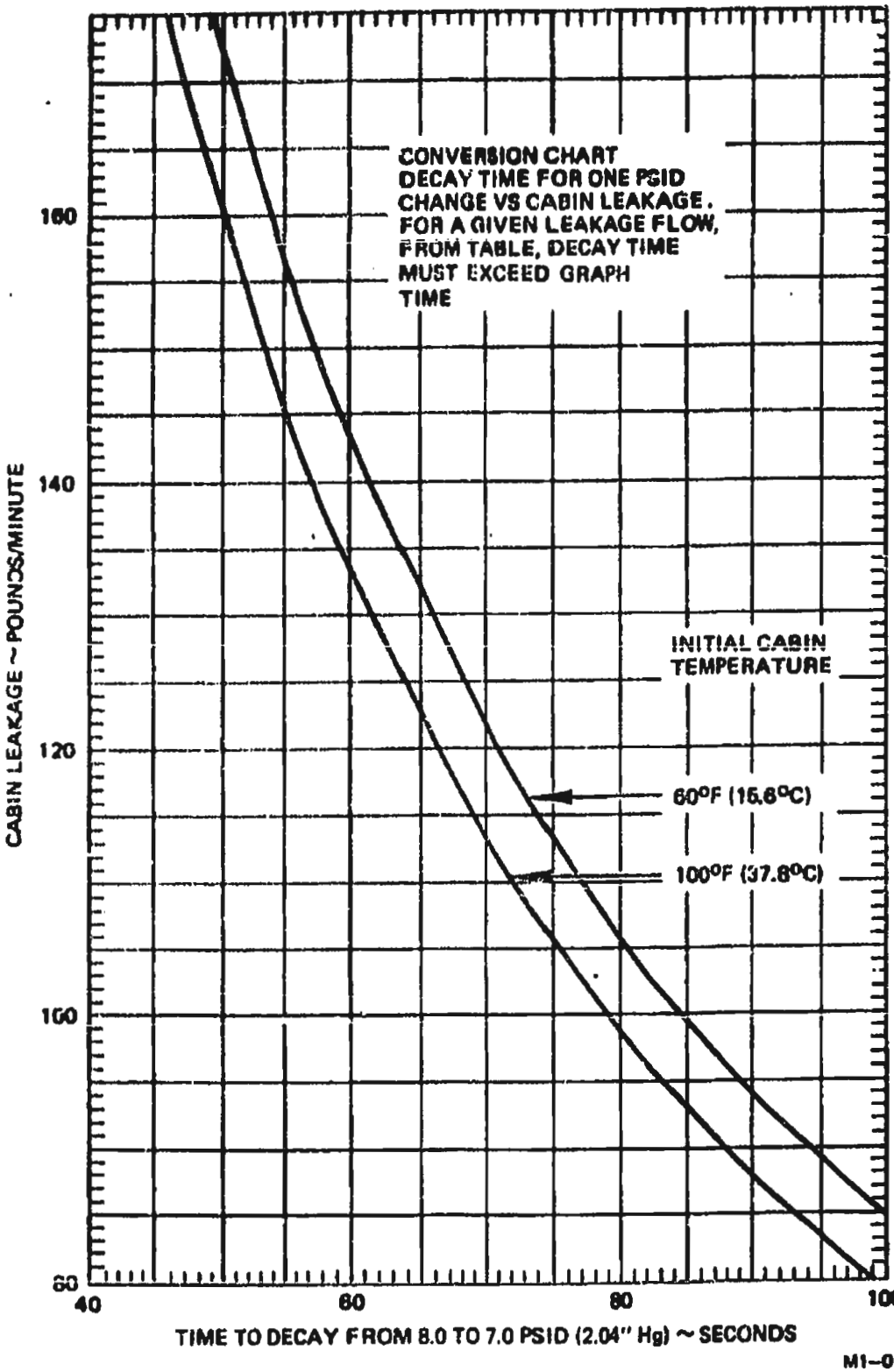
(21) Monitor the cabin rate of climb indicator for a climb (depressurization) rate not to exceed 2000 fpm (normally 500-800 fpm).

(22) When cabin is completely depressurized and both forward and aft outflow valves are full open, operate air conditioning as required (Ref. 21-00-00, 201).

C (23) DELETED

Normal Venting Configuration and Leakage Allowances
Table 501

VENTING SYSTEM OR UNIT	NORMAL CONDITION	LEAKAGE ALLOWANCE LBS/MIN.
NOTE: These leakage allowances are for a 8.0 to 7.0 PSID (16.3 in. to 14.3 in. Hg) cabin pressure decay.		
R Basic Configuration - Including doors, windows, R cable seals, electrical penetration, high R pressure duct, valve, and air cycle machine R leakage		173.5
On aircraft 001-031 with SB53-186 and 032-999, the basic leakage allowance must be increased by 0.5 lbs/min.		
If any of the following vents or valves are blocked off, the leakage allowance shown must be subtracted from the above basic leakage allowance.		
Lavatory Vents	Venting	27.20
Cabin Pressure Control Valves (2)	Closed	22.10
Cabin Pressure Safety Valves (2)	Closed	0.57
Cabin Pressure Relief Valves (2)	Closed	0.43
Forward Electronic Service Center Cooling	Closed	2.41
Mid Electrical Service Center	Closed	2.20
Water Drains (3)	Venting	23.80
Galley Vent (1)	Closed	2.20
Potable Water Heating	Open	2.58



Cabin Pressure Decay Time Chart
Figure 501

CABIN PRESSURE CONTROL PANEL- REMOVAL AND INSTALLATION

1. General

The cabin pressure control panel is located in the Flight Engineer/Second Officers upper panel, zone 215, as part of the integrated pneumatic system (IPS) control panel. The cabin pressure control panel may be removed as a separate unit or as part of the IPS control panel (Ref. 36-00-01).

2. Equipment and Materials

Protective caps

3. Referenced Procedure

21-31-00	Cabin Pressure Control System - Adjustment and Test
34-13-00	Central Air Data Computer System - Adjustment and Test
36-00-01	Integrated Pneumatic System (IPS) Control Panels - Removal and Installation

R 4. Removal/Installation

A. Removal

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag circuit breakers ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - FWD (H1) and AFT (H2).

On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

CABIN PRESS CONT - AUTO - CONT (X9) and POWER (X10)

CABIN PRESS CONT - STBY - CONT (X11) and POWER (X12)

CARGO TEMP - FWD MID (W9)

(2) On Flight Engineer/Second Officers LIGHTS control panel, zone 215, ensure that INSTR and PANEL controls are in OFF position and tagged.

(3) Release panel fasteners on each end of integrated pneumatic system (IPS) control panel by turning a quarter-turn counterclockwise (Ref. 36-00-01).

(4) Carefully pull IPS control panel from rack until support channel stops are engaged.

(5) Disconnect two electrical connectors from cabin pressure control panel. Install protective caps.

(6) Disconnect ambient sensing plumbing line from cabin pressure control panel. Install protective caps.

(7) Remove triwing panel mounting screws from cabin pressure control panel.

(8) Remove cabin pressure control panel from IPS control panel.

B. Installation

(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) Verify that LIGHTS controls checked in Step 3A(2) are in OFF position and tagged.

(3) Ensure that IPS control panel is pulled inboard until stops are engaged.

(4) Place cabin pressure control panel in IPS control panel and secure with triwing screws.

(5) Remove protective caps and connect ambient sensing plumbing line to cabin pressure control panel port.

(6) Remove protective caps and connect two electrical connectors to cabin pressure control panel.

(7) Slide IPS control panel outboard into position in rack and secure panel fasteners.

(8) Remove tags and close circuit breakers opened in Step 3A(1).

(9) Remove tags from LIGHTS control panel.

C CR (10) Perform pertinent portion of leak test on ambient (Static) Sensing System (Ref. 34-13-00).

(11) Perform system operational test - BITE system (Ref. 21-31-00).

CABIN PRESSURE CONTROLLER - REMOVAL AND INSTALLATION

1. General

The cabin pressure controller is located in the forward electronic service center (FESC) in the forward portion of the equipment rack on the right side of the compartment access door.

2. Equipment and Materials

R Protective caps

3. Referenced Procedure

20-23-01 Holddown Extractor - Maintenance Practices

R 21-31-02 Cabin Pressure Controller - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

CABIN PRESSURE CONT

AUTO

CONT (X9)

PWR (X10)

STBY

CONT (X11)

PWR (X12)

(2) Open FESC access door 112AB.

(3) In FESC, disconnect static pressure reference hose from front of controller (quick disconnect). Install protective caps on both hose and controller disconnect fittings.

(4) Release holddown extractors at bottom front of controller (Ref. 20-23-01).

(5) Carefully pull controller straight out of rack (controller weighs 17 pounds).

(6) Install protective caps on controller and rack electrical connectors.

B. Installation

CR (1) To prevent the possibility of damaging a new controller CR during replacement, especially when the BITE shows a CR "no go", the following troubleshooting should be CR performed. All checks are done from the controller CR rack connectors. Refer L-1011 Wiring Diagram 21-31-01 CR for pin assignments.

CR (a) With a Simpson 260 ohmmeter, check forward and aft CR actuator feedback pots for shorts to ground.

CR (b) Check forward and aft tachometer excitation supply CR winding for 1.7K ohms ± 50 ohms to ground.

CR (c) Check that forward/aft tach output signal and CR return resistance is 100 ohms ± 10 ohms and open CR to ground.

CR (1A) Verify circuit breakers listed in Step 4A(1) are opened CR and tagged.

(2) Remove protective caps from controller and rack electrical connectors and inspect connectors for condition and cleanliness.

(3) Verify rack is clean and holddown extractors are fully released.

(4) Carefully slide controller into rack, verifying that electrical connectors mate properly.

(5) Engage and tighten holddown extractors (Ref. 20-23-01).

(6) Remove protective caps from hose and controller quick disconnect fittings, carefully inspect fittings for condition and cleanliness, and connect hose to controller.

(7) Verify quick disconnect is completely engaged.

(8) Close FESC access door 112AB.

(9) Remove tags and close circuit breakers opened in Step 4A(1).

CR (10) Perform pertinent portion of leak test on ambient
CR (static) Sensing System (Ref. 21-31-02 Cabin Pressure
CR Controller - Adjustment/Test).

CR (11) Perform operational test-bite system (Ref. 21-31-00).

CABIN PRESSURE CONTROLLER - ADJUSTMENT AND TEST

1. General

C This test procedure is a leak test for the cabin pressure controller static reference system. The test shall be performed following any maintenance that disconnected any portion of the independent cabin pressure controller static reference system.

Access to the cabin pressure controller, in the forward electronic service center (FESC), is not required unless a static reference system leak is detected. Access is through FESC access door 112AB.

C 2. Equipment and Materials

C Pitot-Static Field Tester, Type MB-1 or Burton 2024B, or equivalent

CR Flush Static Port Adapter 21-31-02-0023 TWA S/N 48-3193

C 3. References

C (1) 21-31-00, Cabin Pressure Control System

C (2) 34-13-00, Pitot-Static System - Adjustment/Test.

C 4. Adjustment/Test

A. Leak Test

(1) Clean skin area around CABIN PRESS CONT static port in lower left forward fuselage. Verify static port is clean and unobstructed.

(2) Install flush static port adapter over static port.

(3) Connect static (vacuum) source of tester to flush static adapter.

(4) Open pitot vent valve and close cross-bleed valve on tester.

CAUTION: DO NOT EXCEED A RATE OF CLIMB OF 5000 FEET PER MINUTE.

C (5) Close static vent valve and slowly open static vacuum
C valve until tester indicator shows 3000 ft..

(6) Close static vacuum valve.

(7) Monitor tester vacuum indicator; after one minute vacuum indicator reading shall not have decreased more than 60 ft. C

CAUTION: DO NOT EXCEED A RATE OF DESCENT OF 5000 FEET PER MINUTE.

(8) Slowly open static vent valve until tester indicator shows field elevation.

(9) Disconnect tester from flush static adapter.

(10) Remove flush static adapter from over port and verify static port is free of obstruction and area around parts is clean.

OUTFLOW VALVES - REMOVAL AND INSTALLATION

1. General

C C R The removal and installation procedures for the forward and aft outflow valves are the same except for circuit breakers. The aft outflow valve is under the center cargo compartment floor access panel 154KT.

2. Equipment and Materials

Protective caps

Gasket, PN 1550962-103, or equivalent

CR CR Cement, Chloroprene Rubber Base, LCM30-2084, or equivalent (TWA Stk. Nbr. 50-0323)

C Solvent, Methyl-Ethyl-Ketone (MEK), TT-M-261, or equivalent

C Solvent, Aliphatic, Naphtha TT-N-95, or equivalent

C Solvent, Toluene, TT-T-548, or equivalent

C C Sealant, General Electric Company Silicone Products, PN RTV-157 or equivalent (TWA Stk. Nbr. 50-1102)

3. Referenced Procedure

21-31-00 Cabin Pressure Control System - Adjustment and Test

4. Removal/Installation

WARNING: KEEP ALL PERSONNEL CLEAR OF VALVE GATES AND ACTUATOR LINKAGE WHEN OUTFLOW VALVE IS OPERATIONAL.

A. Removal

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag the following circuit breakers as applicable:

ENVIR CONTROL SYS - MANUAL CABIN PRESS CONT - FWD (H1),

ENVIR CONTROL SYS - MANUAL CABIN PRESS CONT - AFT (H2).

(2) On the Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers as applicable:

CABIN PRESSURE CONTROL - AUTO - CONT (X9),

CABIN PRESSURE CONTROL - AUTO - PWR (X10),

CABIN PRESSURE CONTROL - STBY - CONT (X11),

CABIN PRESSURE CONTROL - STBY - PWR (X12),

OUTFLOW VALVE - FWD (X14)

OUTFLOW VALVE - AFT (X17).

C (3) DELETED.

NOTE: Removal of access panel is necessary when the applicable outflow valve failed in the closed position.

(4) Disconnect outflow valve electrical cable connectors from valve actuator receptacles, install protective caps on plugs and receptacles, and stow cable to prevent damage. Disconnect bonding cable from aircraft structure (Ref. Fig. 401).

(5) From the outside of the aircraft, remove screws which secure outflow valve assembly to aircraft. Note which length screws are removed from each position, for use during installation.

NOTE: There is a single row of screws around the valve and four extra screws on the inboard end.

Before breaking outflow valve gasket bonding from frame structure, leave several screws loosely in frame to restrain valve movement and to prevent damage to valve.

(6) Carefully loosen valve assembly from aircraft structure and move valve up and inboard enough to permit rotation. Rotate valve and remove through the fuselage opening.

NOTE: On aircraft without SB21-172, the plastic hinge guards may make it difficult

to remove the outflow valve. If so, incorporate
R SB21-172 which removes hinge guards.

B. Installation

NOTE: Plastic hinge guards removed in Step 4A(6) are not to be replaced.

(1) Verify that circuit breakers opened in Steps 4A(1) and 4A(2) are open and tagged.

WARNING: MEK, TOLUENE, AND NAPHTHA SOLVENTS ARE TOXIC AND FLAMMABLE. USE ONLY WITH ADEQUATE VENTILATION. AVOID PROLONGED BREATHING OF FUMES OR SKIN CONTACT.

(2) Clean fuselage opening, frame, and valve flange with MEK, or equivalent. Be sure all gasket material and sealant are removed from surfaces.

(3) Cement a new gasket to valve flange as follows:

(a) Remove all foreign materials from surfaces to be cemented by wiping with a clean cloth saturated with aliphatic naphtha, or equivalent. Wipe surfaces dry with clean dry cloth. Do not allow solvent to air-dry.

(b) Apply an even brush coat of cement to both surfaces to be joined.

NOTE: Adhesive may be thinned with a 50-50 blend of MEK and toluene, if required.

(c) Allow cement to air-dry until it will adhere to, but not transfer to, finger when lightly touched (tacky but not sticky).

(d) Carefully align gasket on outflow valve flange and rub firmly to remove trapped air.

(e) Wipe off excess cement with a clean cloth moistened with MEK, or equivalent.

(4) Pass outflow valve assembly through fuselage opening, rotate into position, and align locating pins.

(5) Install attaching screws in pattern noted during removal (length v/s location). Tighten screws in incremental steps, using a skip pattern to draw valve and frame together evenly.

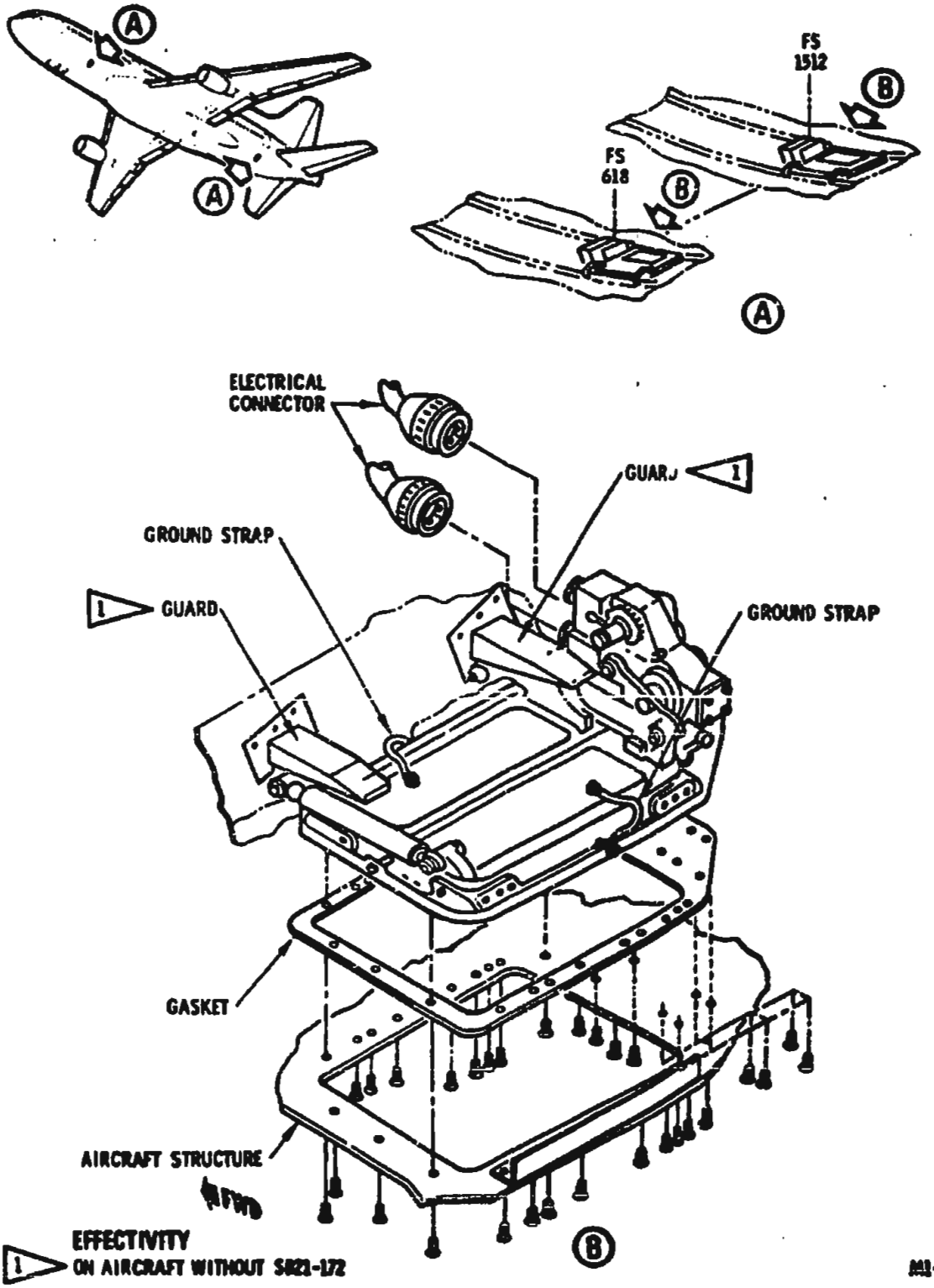
(6) Apply sealant to form a fillet between the valve flange and fuselage frame.

(7) Remove protective caps and connect electrical cable connectors to valve actuator receptacles. Connect bonding cable to aircraft structure.

(8) Remove tags and close circuit breakers opened in Steps 4A(1) and 4A(2).

(9) Test auto and manual modes operation of outflow valve (Ref. 21-31-00).

C (10) DELETED.



R Forward and Aft Outflow Valve - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

OUTFLOW VALVE ACTUATOR - REMOVAL AND INSTALLATION

1. General

Removal and installation procedures for the forward and aft outflow valve actuators are the same except for access panel and circuit breaker references. The forward outflow valve is below the forward cargo compartment and the aft outflow valve is below
R the center cargo compartment.

If the outflow valve is open, or can be opened by use of the manual operation mode (Ref. 21-31-00), the actuator may be removed and installed from outside the aircraft. If the valve cannot be opened, access to the actuator and valve is through cargo compartment floor access panels.

2. Equipment and Materials

Protective Caps

Anti-seize compound, MIL-T-5544, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Cotter-pin, MS9245-44, or equivalent

3. Referenced Procedure

21-31-00 Cabin Pressure Control System - Adjustment and Test

4. Removal/Installation

WARNING: KEEP ALL PERSONNEL CLEAR OF OUTFLOW VALVE GATES AND ACTUATOR LINKAGE WHEN OUTFLOW VALVE IS OPERATIONAL.

A. Removal

(1) Gain access to outflow valve actuator:

(a) If outflow valve is open, access will be through valve gates, proceed to Step 4A(2).

(b) If outflow valve is not open, use auto and/or manual operation modes (Ref. 21-31-00) and attempt to open valve. If valve opens, proceed to Step 4A(2).

(c) If outflow valve cannot be opened, remove cargo floor access panel; 124LT in forward cargo floor for forward outlfow valve or 154 KT in mid cargo floor for aft outlfow valve, then proceed to Step 4A(2).

(2) On pilots overhead circuit breaker panel CB1, zone 210, open and tag following applicable circuit breaker:

ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONT - FWD (H1),

ENVIR CONTROL SYSTEM - MANUAL CABIN - PRESS CONT - AFT (H2).

(3) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

CABIN PRESSURE CONTROL - AUTO - CONT (X9),

CABIN PRESSURE CONTROL - AUTO - PWR (X10),

CABIN PRESSURE CONTROL - STBY - CONT (X11),

CABIN PRESSURE CONTROL - STBY - PWR (X12),

OUTFLOW VALVE - FWD (X14),

OUTFLOW VALVE - AFT (X17).

(4) Install WARNING tag on Flight Engineer/Second officer CABIN PRESSURE CONTROL panel to prevent inadvertent reactivation of circuits and operation of outflow valve.

(5) Disconnect electrical cable connectors from valve actuator receptacles, install protective caps on connectors and receptacles, and stow cable to prevent damage.

(6) Remove cotter-pin, nut, bolt and washers connecting actuator linkage arm to valve aft gate (Ref. Fig. 401).

(7) Remove 4 (four) mounting bolts from outside and 2 (two) screws from inside securing actuator support feet to valve frame.

CR
CR NOTE: The two screws may be replaced with hex head bolts NAS620404(32-4131).

(8) Lift actuator straight up, to release locator pins on feet, and remove actuator to padded work surface.

(9) Remove screw and washer securing actuator output lever on actuator shaft and remove lever, with linkage arm, for installation on replacement actuator.

B. Installation

(1) If working from cargo compartment, proceed to Step 4B(2). If working through outflow valve gates, run actuator to full open position as follows:

(a) Hold actuator near installed position, remove protective caps and connect electrical cable connectors to valve receptacles.

(b) On pilots overhead circuit breaker panel CB1, zone 210, remove tag and close applicable ENVIR CONTROL SYSTEM - MANUAL CABIN PRESS CONTROL - FWD or - AFT circuit breaker.

(c) Use manual operation mode (Ref. 21-31-00) to run actuator to full open position.

(d) Open and tag circuit breaker closed in Step 4B(1)(b) above.

(e) Disconnect electrical cable connectors from valve receptacles, install protective caps, and stow cable to prevent damage.

(2) Verify circuit breakers opened in Steps 4A(2) and 4A(3) are open and tagged.

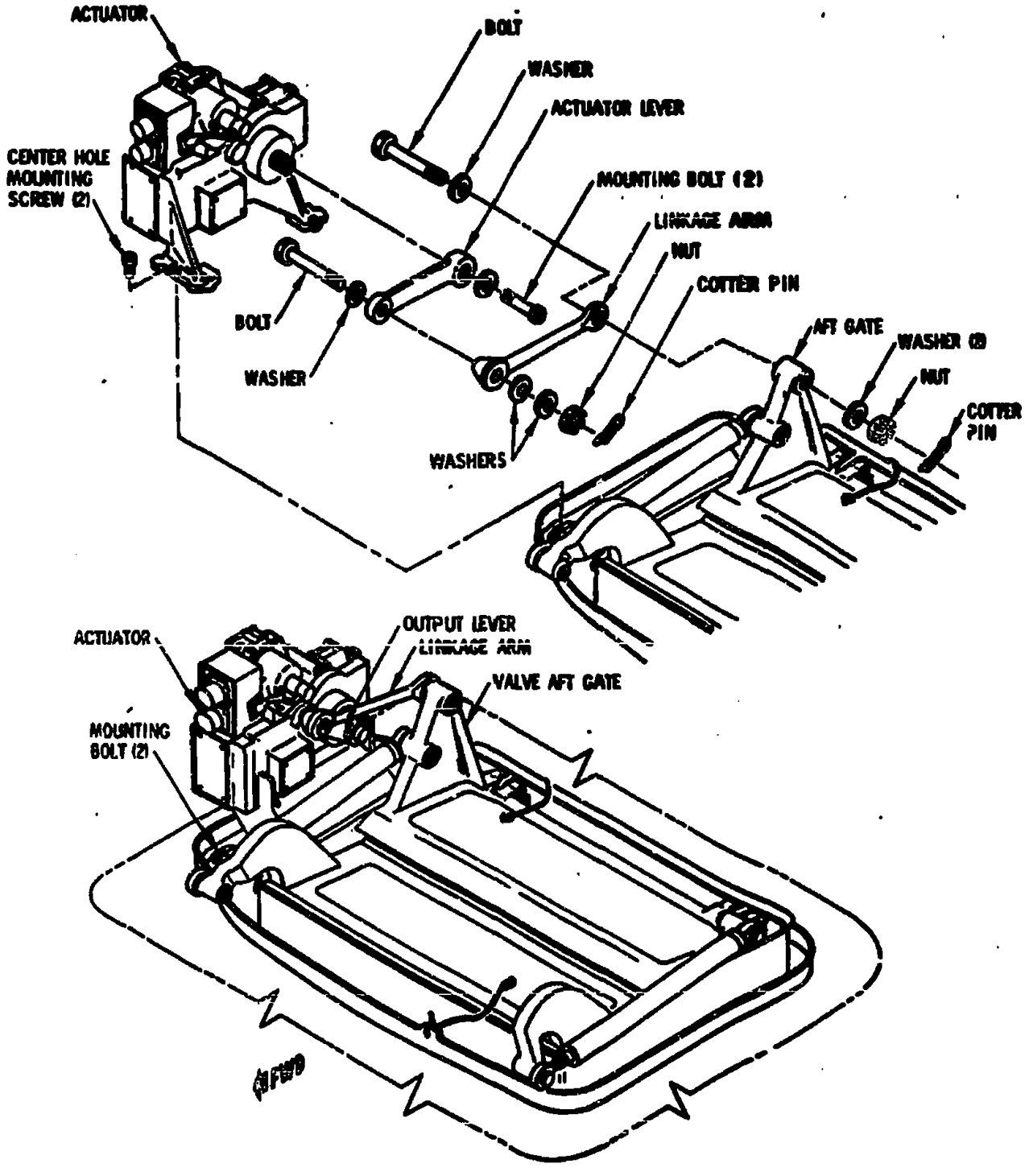
CAUTION: VERIFY THAT THE BOLT CONNECTING THE ACTUATOR TO THE LINKAGE ARM IS INSTALLED WITH THE BOLT HEAD TOWARD THE ACTUATOR.

(3) Install actuator output lever, with linkage arm, on actuator output shaft (Ref. Fig. 401):

(a) Locate blind spline on shaft and in lever and slide lever onto shaft.

(b) Using anti-seize compound on screw threads, install screw and washer securing output lever on actuator output shaft. Torque screw 80 to 85 lb in. above running torque.

(c) Lockwire screw to actuator output lever.



M1-0101-21-200

Outflow Valve Actuator - Removal and Installation
Figure 401

(4) Install actuator on valve frame:

(a) Clean actuator mounting surface and actuator locating holes in valve frame.

(b) Holding linkage arm up, place actuator in position on valve frame, engaging actuator locating pins in locating holes.

NOTE: If the actuator was installed with tri-wing bolts (NAS 5004-4), these may be discarded and replaced with equivalent hex head tri-wing bolts P/N NAS 6204-4. This will facilitate easier removal of actuator from outside when outflow valve is open.

(c) Install 2 (two) mounting screws from inside through center hole of actuator feet securing actuator support feet to valve frame.

(d) Install 4 (four) mounting bolts securing actuator and valve frame to aircraft through outside. Torque bolts 50 to 60 lb in. above running torque.

(5) Connect linkage arm to valve aft gate:

(a) Position valve gates and linkage arm to align free end of linkage arm with hole in gate lever.

(b) Install one washer on bolt, install bolt through linkage arm and gate lever.

(c) Using anti-seize compound on bolt threads, install other washer(s) and nut on bolt. Torque nut 80 to 85 lb in. above running torque with slot in nut aligned with hole in bolt.

(d) Install cotter pin through nut and bolt.

(6) Remove protective caps and connect electrical cable connectors to actuator receptacles.

(7) Remove tags and close all circuit breakers opened in Steps 4A(2) and 4A(3).

(8) Test auto and manual modes operation of outflow valve (Ref. 21-31-00).

(9) Close access panel, if opened.

AEI OUTFLOW VALVE ACTUATOR - MAINTENANCE PRACTICES

1. General

The aft outflow valve is in the bottom of the fuselage below the mid cargo compartment. Access to deactivate the valve is through mid cargo compartment floor access panel.

2. Equipment and Materials

Tape, Pressure-sensitive, Fed Spec PPP-T-60, 2-inch wide, or equivalent.

Protective caps

R Referenced Procedure

R 6-50-00 Interior Access Doors and Panels

R 4. Deactivation

A. Valve Inoperative in Fully Closed Position:

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and collar circuit breaker OUTFLOW VALVE - AFT (X17).

(2) On pilots overhead circuit breaker panel CB1, zone 210 open and collar circuit breaker MANUAL CABIN PRESS
CR CONTROL - AFT (H2). V.P.I. will indicate - valve open

(3) On Flight Engineer/Second Officers CABIN PRESSURE CONTROL panel, zone 215, depress AFT - MNL switchlight. MNL legend will not illuminate.

(4) On same panel, placard AFT outflow valve control OPEN - CLOSE switch AFT OUTFLOW VALVE INOPERATIVE.

(5) Make appropriate entry in aircraft log book.

B. Valve Inoperative in Any Open Position:

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and collar circuit breaker OUTFLOW VALVE - AFT (X17).

(2) On pilots overhead circuit breaker panel CB1, zone 210 open and collar circuit breaker MANUAL CABIN PRESS
CR CONTROL - AFT (H2). V.P.I. will indicate - valve open

(3) Open mid cargo compartment floor access panel 154KT for
R access to aft outflow valve (Ref. 6-50-00).

(4) Disconnect both electrical connectors from outflow valve actuator, install protective caps on cable and actuator connectors and stow cable.

(5) Disconnect outflow valve actuator push-pull rod from actuator lever, manually close outflow valve gates, and tape push-pull rod securely to spring cartridge.

(6) Where valve gates meet, use tape to securely seal valve gates together.

R (7) Close access panel (Ref. 6-50-00).

(8) On Flight Engineer/Second Officers CABIN PRESSURE CONTROL panel, placard AFT outflow valve control OPEN - CLOSE switch AFT OUTFLOW VALVE INOPERATIVE.

(9) Make appropriate entry in aircraft log book.

R CARGO COMPARTMENT PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

R 1. General

R Cargo compartment pressure relief valves serve the dual purpose
R of allowing pressurization of the cargo compartments and
R providing relief for the cargo compartment in the event of
R sudden decompression.

R There is one relief valve in each cargo compartment. The valves
R are located adjacent to the respective cargo compartment door.

R 2. Description

R The relief valve consists of four independently operated panels.
R The two small panels (Ref. Fig. 401) are spring-loaded closed,
R and will open at 1/4 to 1/2 psid during pressurization. The
R panels open in opposite directions. When the compartment is
R within 1/4 psid of the cabin pressure, the panel will close.

R If the cabin pressure is suddenly lost, the intermediate-size
R panel will open, allowing air out of the cargo compartments,
R thus preventing damage to the compartment structure. Once open,
R the panel remains open and must be manually closed.

R If the cargo compartment door seal should be lost, the large
R panel of the relief valve opens, allowing air out of the cabin
R and thus preventing damage to the compartment structure.

R 3. Removal/Installation

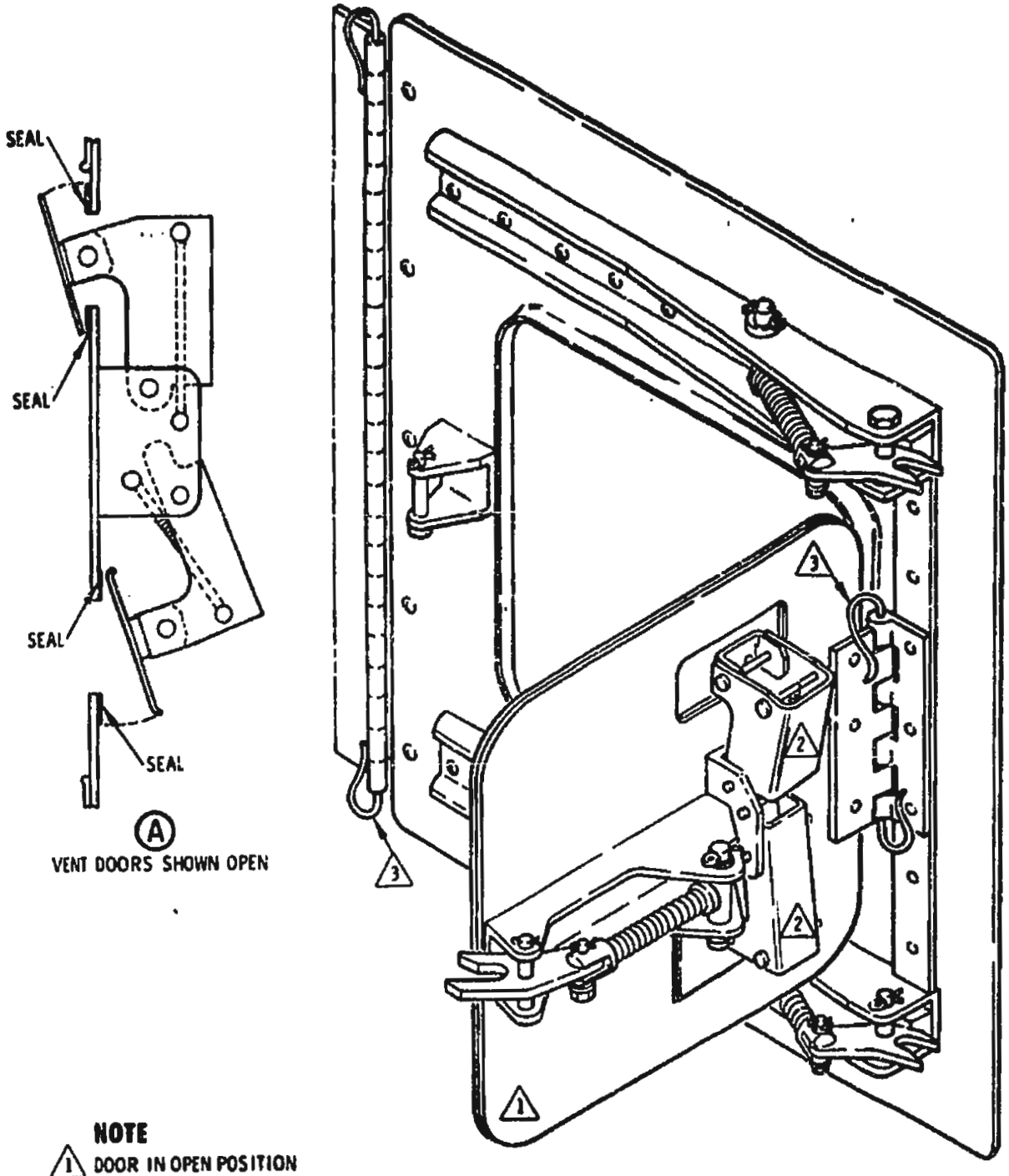
R A. Removal

R The valve is removed by first opening the latch of the large
R panel and then pulling both pins at the opposite ends of
R hinge.

R If it is necessary to remove only the intermediate relief
R panel of the valve, it is removed by first opening this
R relief panel at the latch and then pulling both pins at the
R opposite ends of the hinge. When this panel is removed, the
R two smaller relief panels are removed with it.

R B. Installation

R Align valve hinge with the hinge on the aircraft structure
R and insert pins from both ends and latch the valve closed.



R R Cargo Compartment Pressure Relief Valve
Figure 201

R 4. Maintenance Practices

R If the valve opens during flight, it must be closed manually.
R The intermediate-size panel of the relief valve is closed by
R first opening the larger panel, and then closing the
R intermediate panel from behind and then closing the large panel
R of the valve.

R . . . If the seals at any of the four panels are damaged, it must be
R replaced with same size adhesive foam seal.

R There is no adjustment and test required for the valve.

SAFETY RELIEF SYSTEM - DESCRIPTION AND OPERATION

1. General

The safety relief system (Ref. Fig. 1) is comprised of the positive pressure relief cabin safety valves and the negative pressure relief valves.

The two sets of cabin safety valves are used to provide backup safety for the normal cabin pressure control system (Ref. 21-31-00). The two positive pressure valves operate independently to limit cabin differential pressure at 8.70 to 8.80 pounds per square inch differential. The valves are installed side by side in the lower right fuselage outboard of the forward cargo compartment and forward of the cargo loading door, zone 122. Static pressure ports for each positive
R pressure valve are located on the left side of the fuselage
R opposite and aft of the valves. Either valve alone provides safety relief protection.

Static pressure lines are self-draining and are provided with clear plastic drain bottles with yellow float balls (Ref. Fig. 1) to permit monitoring and removal of trapped moisture.

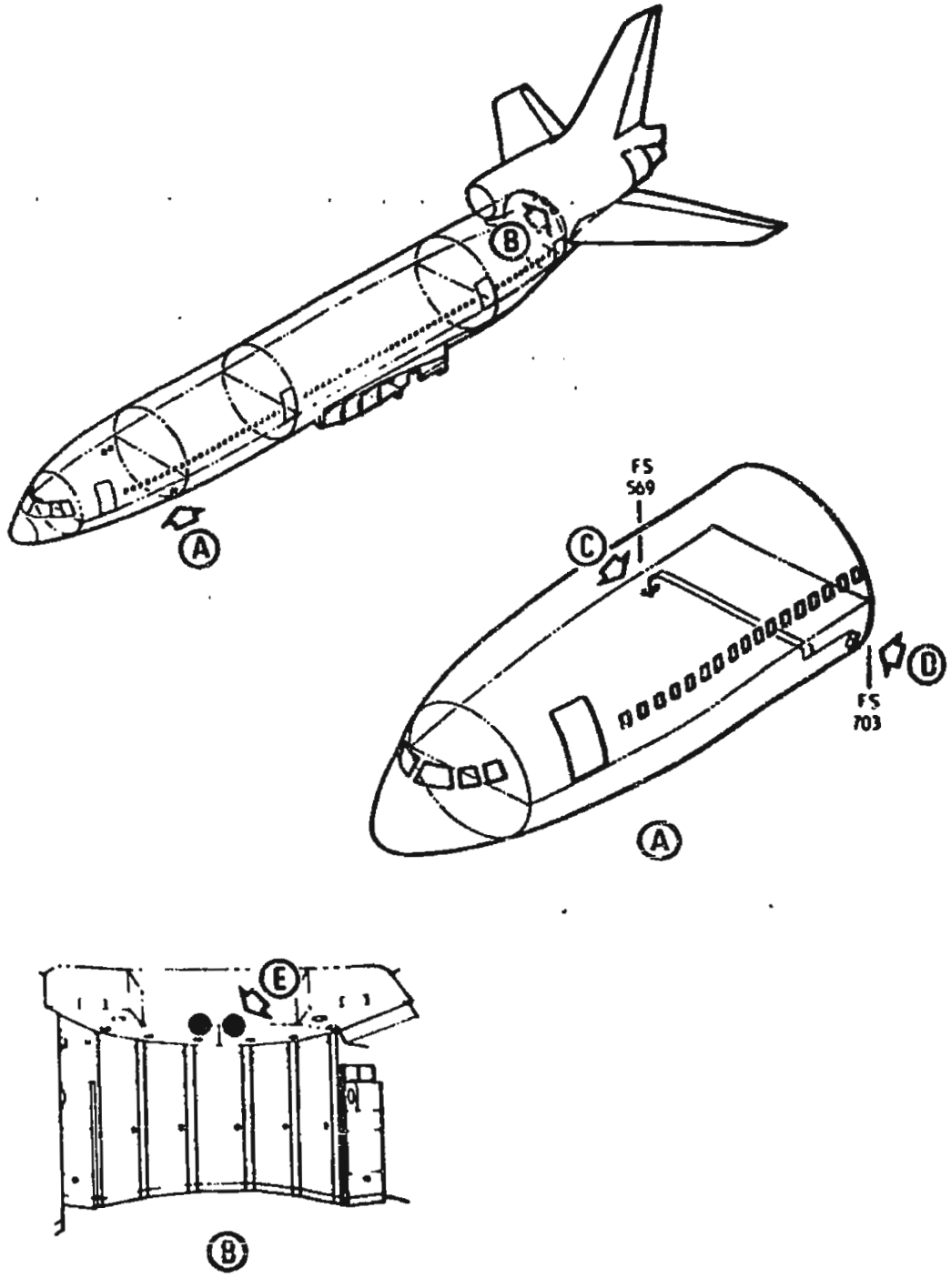
The two negative pressure relief valves are installed in the upper portion of the aft pressure bulkhead, zone 280. These valves, which are inward-opening flapper-type valves, prevent cabin pressure from becoming less than atmospheric (could occur during an extremely rapid descent from altitude). On the ground, the valves allow cabin pressure to change with atmospheric pressure when all fuselage openings are closed.

2. Cabin Safety Valve

A. Description

The cabin safety valve is self-controlled and pneumatically actuated. The valve is an inward-opening outflow poppet-type valve with a flat, two-section hinged flapper valve on the poppet exhaust. Major components of the valve assembly include two aluminum castings, a cup-shaped aluminum outflow poppet valve, an aluminum sheet metal housing, and two fiber glass and aluminum half-disc flapper valves (Ref. Fig. 2).

The lower casting forms the attachment to the fuselage structure and support points for other valve components including the sheet metal housing. The two half-disc flappers are center-hinged and spring-loaded to the closed



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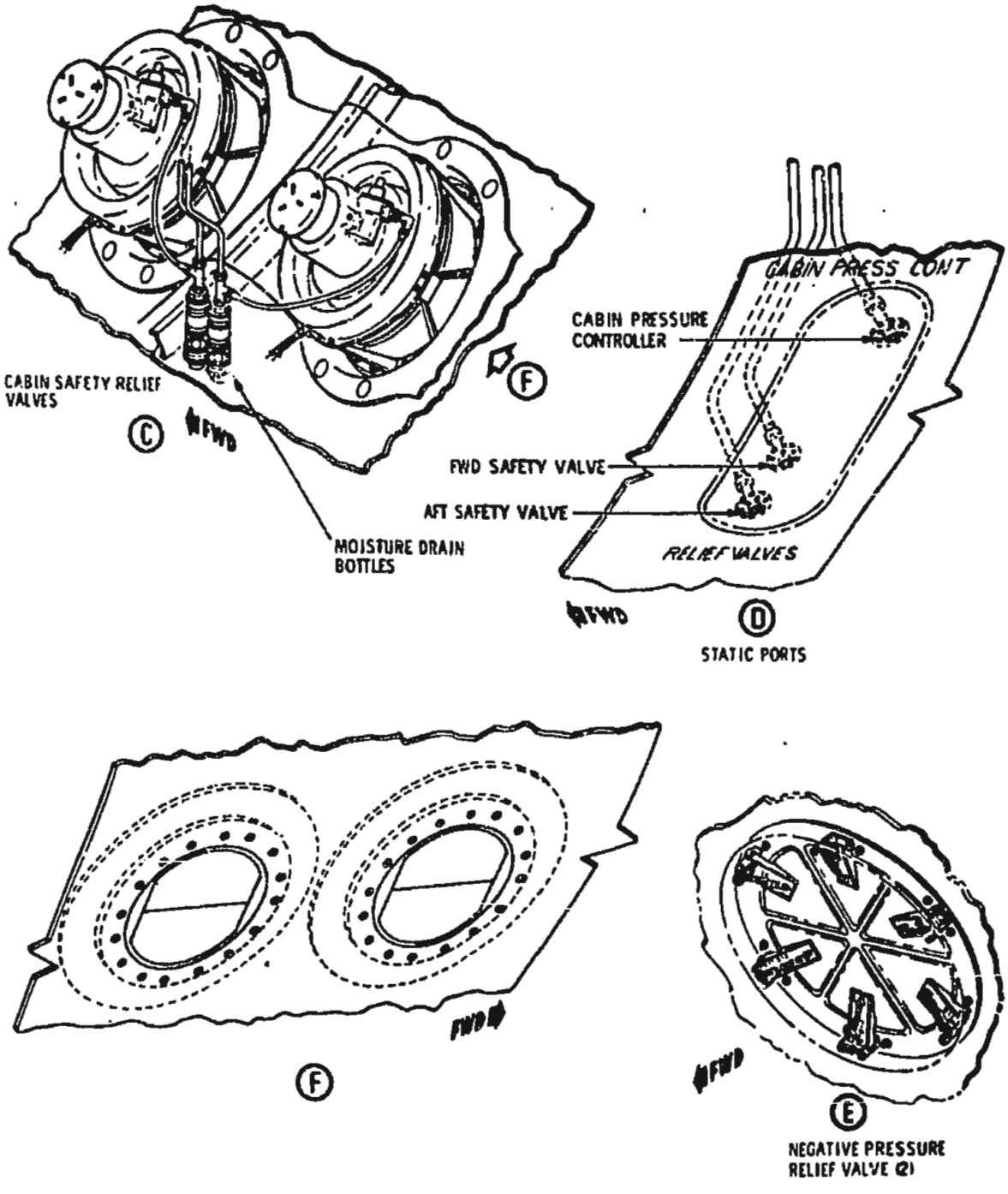
R
R

Cabin Safety Relief System
Figure 1 (Sheet 1)

EFFECTIVITY: ALL

050B



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R
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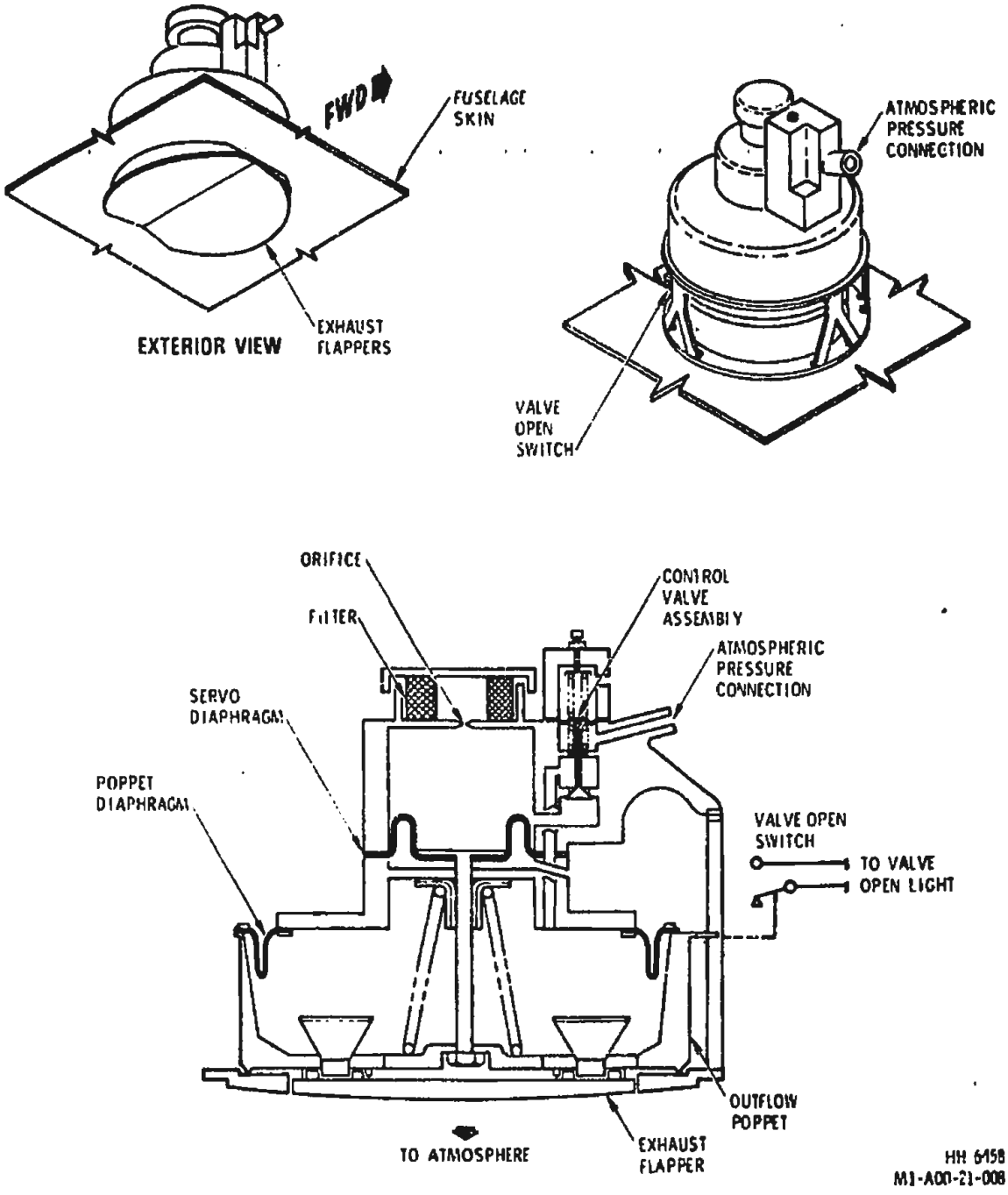
Cabin Safety Relief System
Figure 1 (Sheet 2)

EFFECTIVITY: ALL

001B



Cabin Safety Valve
Figure 2

or open position from an overcenter position. The flappers are flush with the exterior fuselage skin until pushed open by exhaust air. This casting also provides the circular valve seat for the inward-opening outflow poppet valve.

The outflow poppet valve is spring-loaded toward closed, and joined to the upper part of the lower casting by a silicon-rubber-coated dacron fabric diaphragm. The valve is guided by a piston rod through the top of the lower casting to connect to the servo diaphragm. The lower side of the outflow poppet valve and diaphragm are exposed to ambient pressure, and the upper side is exposed to cabin pressure.

The upper and lower castings are fastened together at the servo diaphragm. The lower surface of the diaphragm is exposed to cabin pressure through a port in the lower casting. The upper surface receives a metered cabin pressure through the replaceable 0.3-micron filter and an orifice.

The upper servochamber (above the diaphragm) is also connected through a drilled passage to the poppet of the differential pressure sensing control valve. This control valve assembly includes a poppet valve, a diaphragm, and calibration springs. The upper surface of this diaphragm is exposed to cabin pressure through a port in the casting. The lower surface is exposed to ambient atmospheric pressure through a tube connected to an individual static port near the valve.

A valve position switch on the side of the main valve housing is actuated by the outflow valve poppet when it is closed. When the valve poppet opens (any amount) the switch is released, and the normally closed contacts complete the circuit to light the corresponding SAFETY VALVE FWD OPEN or SAFETY VALVE AFT OPEN advisory light on the Flight Engineer/Second Officers upper instrument panel, zone 215.

B. Operation

During normal flight the spring in the large outflow poppet valve and cabin differential pressure hold the valve closed. When cabin pressure increases to near the design operating pressure, the control valve poppet begins to open. By the time cabin differential pressure reaches 8.70 pounds per square inch differential (psid), the control valve poppet is open to bleed the metered cabin airflow from the upper servochamber faster than it is flowing in through the orifice.

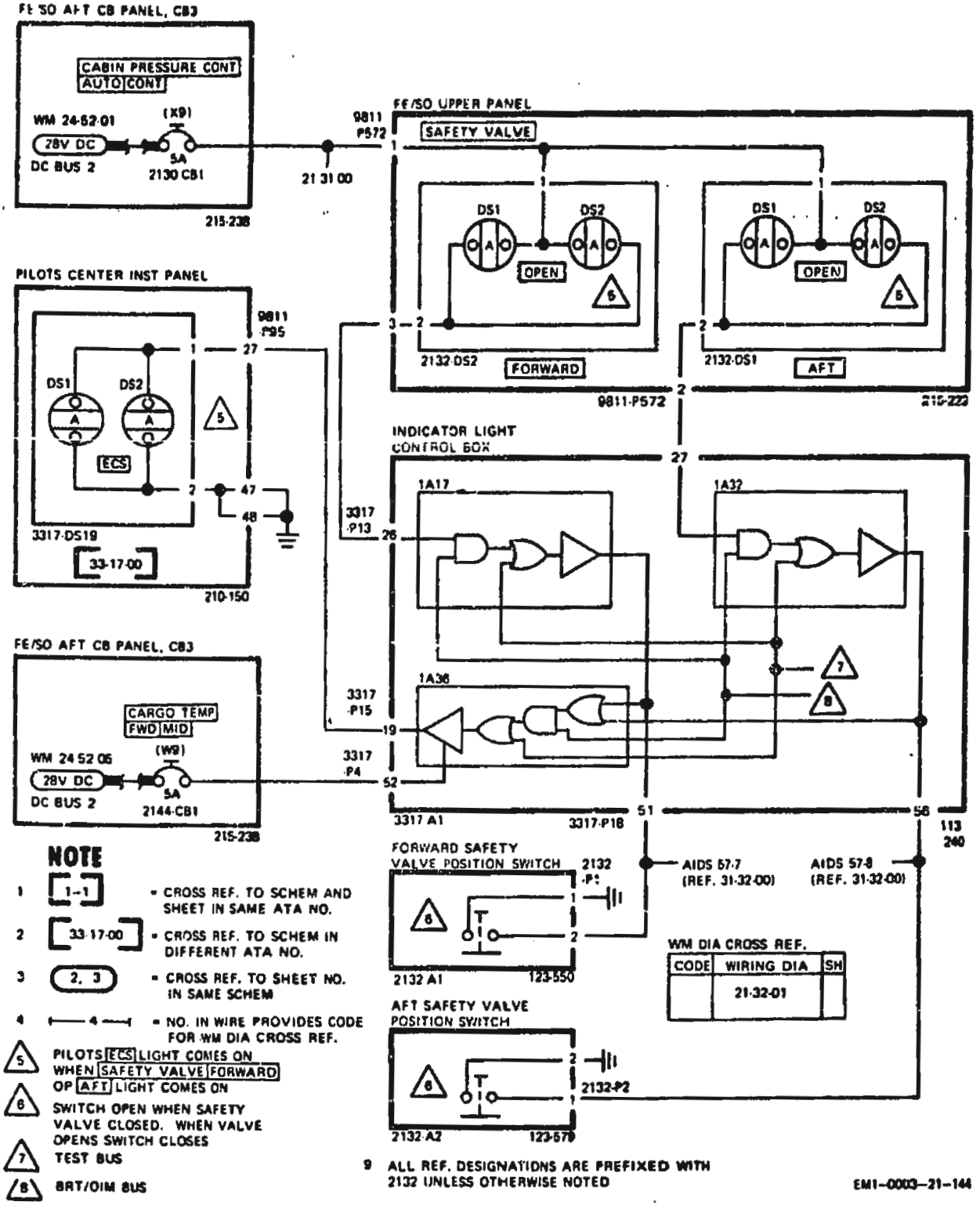
The resulting pressure differential across the servo-diaphragm pulls up on the piston rod to open the

outflow poppet valve, which exhausts cabin pressure to atmosphere through the half-disc flappers. When the valve opens, the valve switch (Ref. Fig. 3) closes and turns on the OPEN legend above the CABIN PRESSURE CONTROL panel on the Flight Engineer/Second Officers upper instrument panel, zone 215. At the same time, the ECS legend on the pilots caution lights on the main instrument panel, zone 210, comes on.

The degree the outflow poppet valve opens is proportional to the degree the control valve poppet is open; the outflow poppet valve opens to limit cabin differential pressure to a maximum of 8.80 psid.

When cabin differential pressure is decreased to less than 8.70 psid, the valve returns to the closed position, and the SAFETY VALVE (FWD or AFT) OPEN light goes out.

The flappers, which remain open after the poppet valve has closed, are closed manually on the ground.



NOTE

1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [33-17-00] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5. PILOTS ECS LIGHT COMES ON WHEN SAFETY VALVE FORWARD OP AFT LIGHT COMES ON
6. SWITCH OPEN WHEN SAFETY VALVE CLOSED. WHEN VALVE OPENS SWITCH CLOSES
7. TEST BUS
8. BRT/DIM BUS
9. ALL REF. DESIGNATIONS ARE PREFIXED WITH 2132 UNLESS OTHERWISE NOTED

EM1-0003-21-144

Cabin Safety Valve Schematic
Figure 3

R # SAFETY RELIEF SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting safety relief system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify manditory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the safety relief system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
SCHEM 1	Cabin Safety Valve Schematic

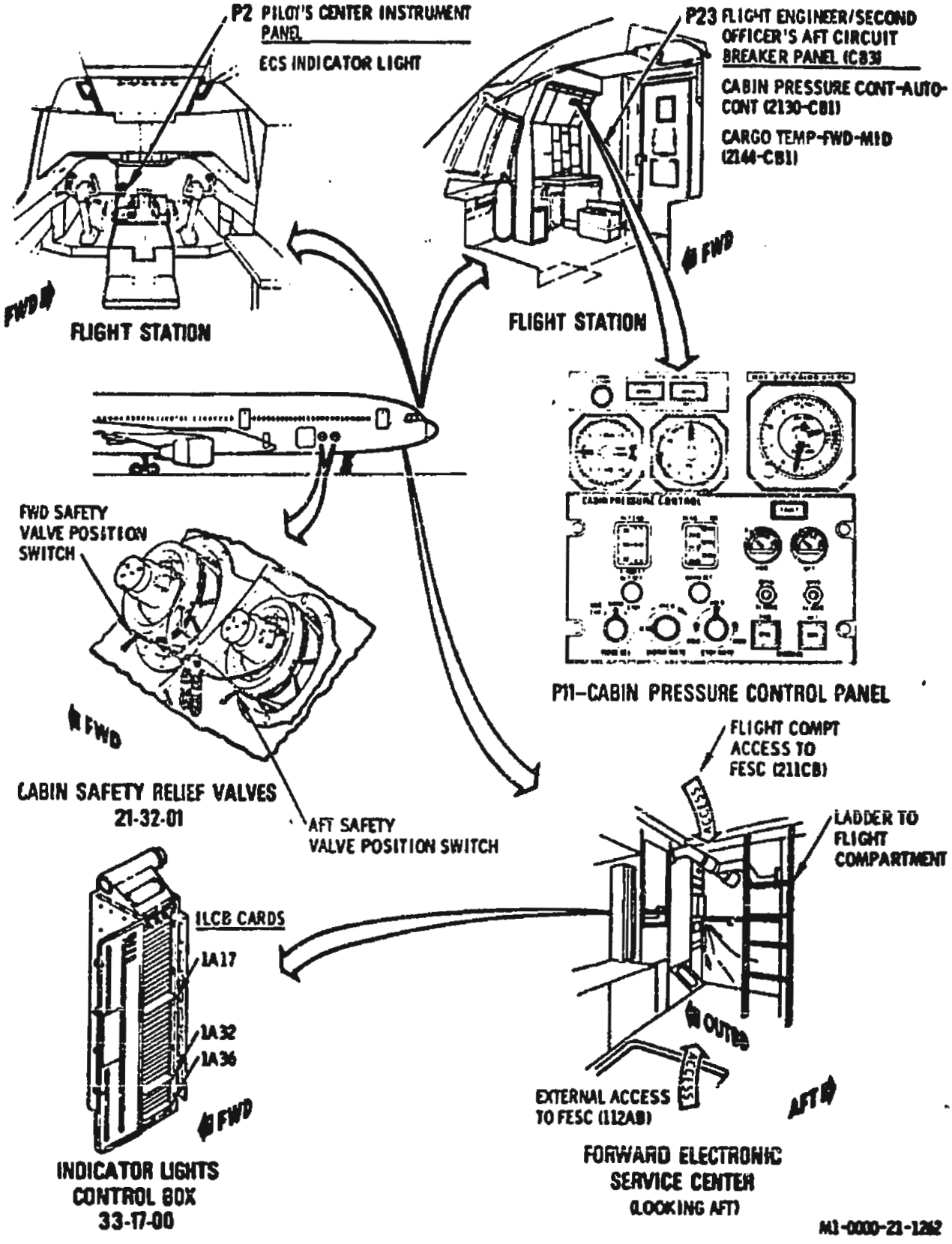
COMPONENT	QTY	AREA/ACCESS	REFERENCE
BOX – INDICATOR LIGHTS CONTROL:			
ILCB CARD 1A17	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A32	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A36	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
CIRCUIT BREAKERS:			
CABIN PRESSURE CONT – AUTO – CONT (2130-CB1)	1	FLT STA/CB3 (X9)	*
CARGO TEMP – FWD – MID (2144-CB 1)	1	FLT STA/CB3 (W9)	*
INDICATOR LIGHTS:			
ECS (3317-DS19)	1	FLT STA, PILOTS CENTER INSTRUMENT PANEL/P2	*
SAFETY VALVE AFT OPEN (2132-DS1)	1	FLT STA, FE/SO CABIN PRESSURE CONTROL PANEL/P11	*
SAFETY VALVE FWD OPEN (2132-DS2)	1	FLT STA, FE/SO CABIN PRESSURE CONTROL PANEL/P11	*
SWITCH – FWD SAFETY VALVE POSITION (2132-A1)	1	FWD CARGO RH SIDE ON SAFETY VALVE HOUSING/122BR	21-32-01
SWITCH – AFT SAFETY VALVE POSITION (2132-A2)	1	FWD CARGO RH SIDE ON SAFETY VALVE HOUSING/122BR	21-31-01

*SEE WM EQUIPMENT LIST

M1-0000-21-1264

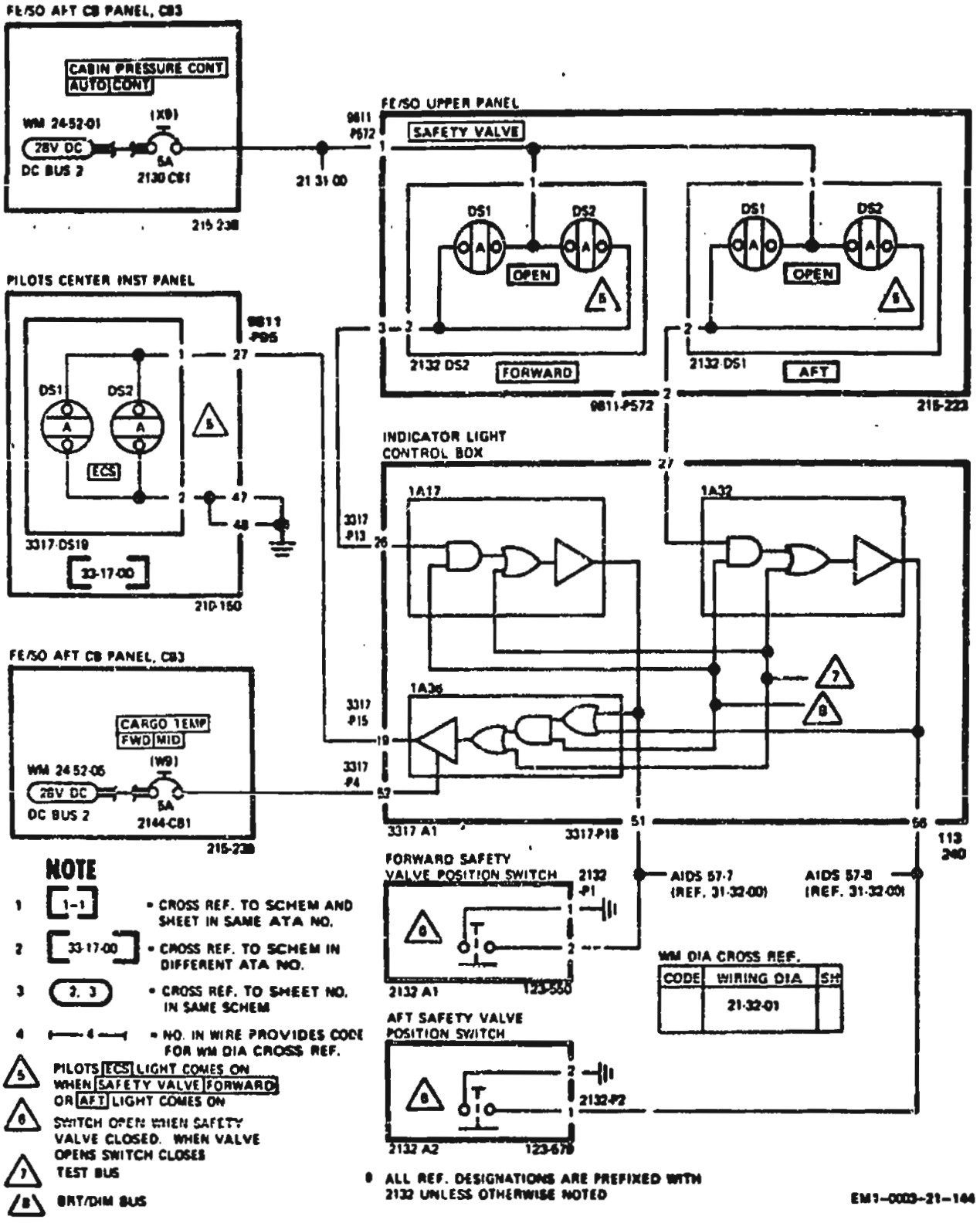
R
R Component Location Index
Figure 101

R EFFECTIVITY: ALL
R
001B



Component Locator Diagram
Figure 102

EFFECTIVITY: ALL



R R Cabin Safety Valve Schematic
SCHEM 1

R R 001B EFFECTIVITY: ALL

CABIN SAFETY VALVE - MAINTENANCE PRACTICES

1. General

The two cabin safety valves are in the lower right fuselage forward of the forward cargo loading door. Access to deactivate either safety valve is through cargo compartment liner panel 122AR.

2. Equipment and Materials

Plumbing cap and plug

3. Referenced Procedure

25-51-06 Forward Cargo Compartment Liner - Removal and Installation

4. Maintenance Practices

A. Deactivation

(1) Remove static drain bottle access cover 122KR on forward cargo compartment liner panel (Ref. 25-51-06).

(2) Verify inoperative cabin safety valve is closed.

(3) Depress filter cover (Ref. Fig. 201) and turn in a counterclockwise direction to remove cover with spring from cabin safety valve.

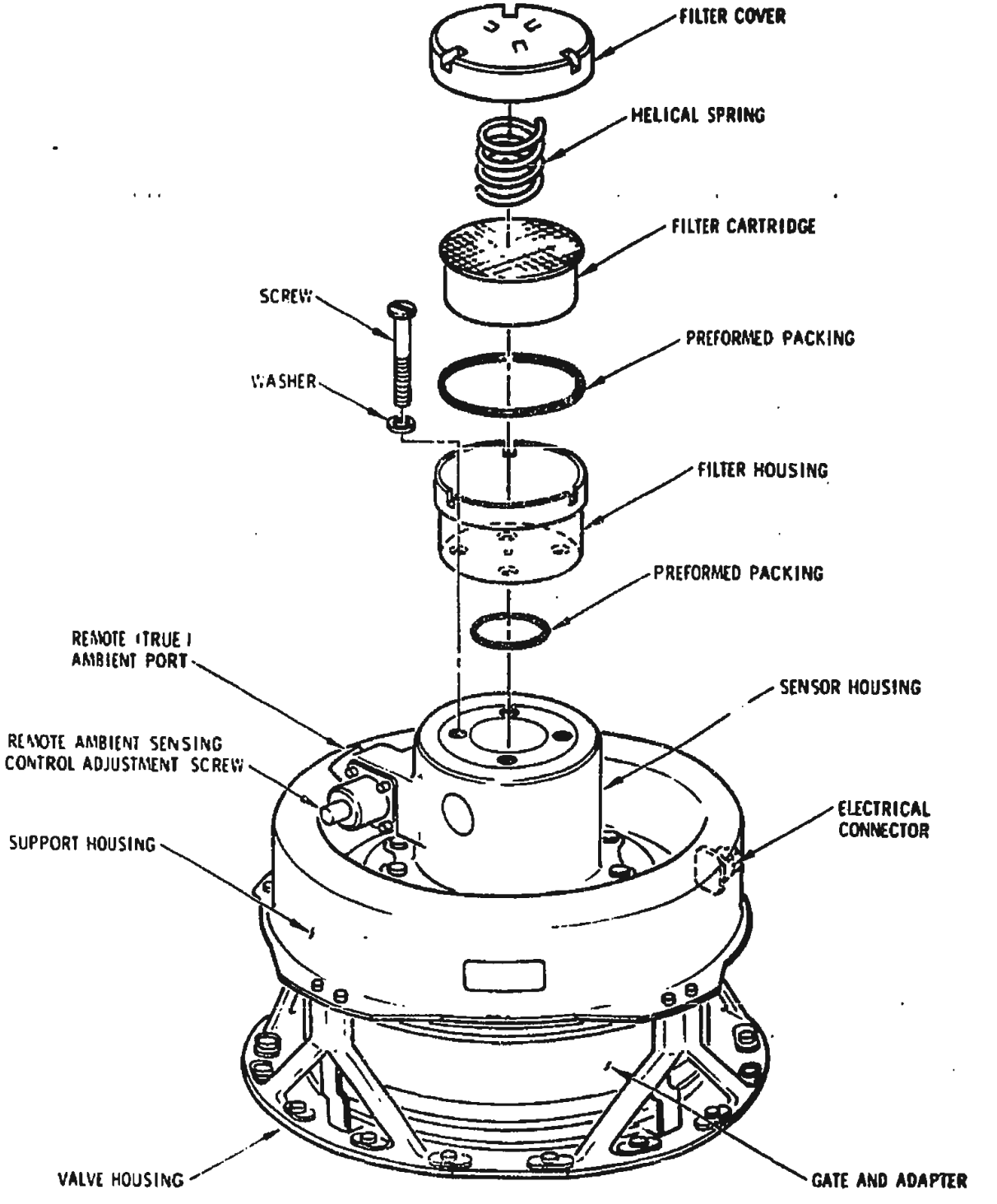
(4) Pull filter cartridge from filter housing. Remove preformed packing from filter cartridge and discard.

(5) Separate filter housing from sensor housing by removing screws and washers.

(6) Remove preformed packing from sensor housing and discard.

R (7) Retain filter cover with spring, filter cartridge and filter housing removed in Steps 4A(3), 4A(4) and 4A(5) respectively, for reinstallation.

(8) Reinstall compartment liner panel.



R
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Cabin Safety Valve - Deactivation
Figure 201

R (9) Above Flight Engineer/Second Officers CABIN PRESSURE
R CONTROL panel, zone 215, placard applicable SAFETY
R VALVE - FWD or - AFT indicator light SAFETY VALVE
R INOPERATIVE.

R (10) Make appropriate entry in aircraft log book.

CABIN SAFETY VALVES - REMOVAL AND INSTALLATION

1. General

The removal and installation procedures for the forward and aft cabin safety relief valves are identical.

2. Equipment and Materials

Protective caps

Seal

3. Referenced Procedures

R	06-50-00	Interior Panels Forward Cargo Compartment
	21-32-01	Cabin Safety Valves - Adjustment and Test
	25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CABIN PRESSURE CONTROL - AUTO - CONT (X9).

R R (2) Remove static drain bottle access cover 122KR (Ref. 06-50-00) on forward cargo compartment liner panel (Ref. 25-51-06).

(3) Disconnect electrical connector from valve to be removed. Install protective caps on plug and receptacle.

(4) Disconnect static hose from the valve fitting. Install protective caps on fitting and hose.

(5) From outside of aircraft, remove screws which attach valve to aircraft structure.

(6) Remove valve from aircraft.

(7) Remove and discard seal installed under valve.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Clean any residual seal material from mating surfaces.

(3) Position a new seal on aircraft structure. Be sure alignment pin hole in seal is in proper position.

(4) Position valve on seal. Be sure alignment pin engages alignment hole.

(5) Install attachment screws and tighten in incremental steps, using a skip pattern, to draw valve and structure together evenly.

(6) Remove protective caps and install static hose.

(7) Remove protective caps and install electrical connector.

CR (8) Connect static (vacuum source) to flush static port,
CR apply static vacuum source slowly until testor
CR indicator reads 3,000 feet. After one minute, reading
CR shall not have decreased more than 60 feet.

(9) Reinstall cargo compartment panel.

(10) Remove tag and close circuit breaker opened in Step 4A(1).

CABIN SAFETY VALVE - ADJUSTMENT AND TEST

1. General

This test procedure includes a leak test and a functional test. The on-ground functional test simulates in-flight operation with cabin pressurization by using a vacuum source connected to the cabin safety valve ambient sensing ports to obtain valve operation.

In-flight operational test of the valves is made using manual cabin pressure control procedures detailed in the flight manual. On-ground operational test is not recommended. If an on-ground operational test must be made, (Ref. 21-31-00). On-ground operational test procedures would then be similar to those for in-flight operational test.

2. Equipment and Materials

Pitot-Static Field Tester Type MB-1 or Pitot-Static Field Tester Burton 2024B, or equivalent

C Flush Static Port Adapter 21-31-02-0023.

3. Referenced Procedures

21-32-01	Cabin Safety Valve - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices

4. Adjustment/Test

A. Leak Test

The cabin safety valve must remain closed throughout the following leak test. If safety valve opens within test parameters it must be replaced (Ref. 21-32-01) and leak test repeated.

CR CR CR NOTE: If valve is replaced due to time control, perform 3000 ft. leak check at ambient port; local port adapter not required.

(1) Clean skin area around RELIEF VALVES static ports, verify ports are clean and unobstructed, and install flush static port adapter on port for valve under test (Ref. Fig. 501).

NOTE: Lowest port (Ref. Fig. 501) is for aft safety valve and the middle port is for the forward safety valve. The uppermost port is for the cabin pressure controller.

(2) Open safety valve exterior flapper and install valve test fixture local port adapter in local ambient port inside valve (Ref. Fig. 501).

(3) Connect static (vacuum) source of tester to flush static adapter and to local port adapter.

(4) Open pitot vent valve and close cross-bleed valve on tester.

CAUTION: DO NOT EXCEED A RATE OF CLIMB OF 5000 FEET PER MINUTE.

C C (5) Close static vent valve and slowly open static vacuum valve until tester indicator shows 3,000 ft. on altimeter.

(6) Close static vacuum valve and record indicator reading.

CR CR CR (7) After one minute, vacuum indicator reading shall not have decreased more than 60 ft. If valve is replaced due to time control, local port adapter may be eliminated.

(8) If functional test is not to be performed, proceed with Steps 4A(9) through 4A(12). To perform functional test, proceed directly to Step 4B(1).

CAUTION: DO NOT EXCEED A RATE OF DESCENT OF 5000 FEET PER MINUTE.

C (9) Slowly open static vent valve until tester indicator shows field elevation.

(10) Disconnect tester from flush static adapter and local port adapter.

(11) Remove flush static adapter and verify static port is free of obstruction and area around ports is clean.

(12) Remove local port adapter and verify exterior flapper of valve moves freely to full closed position.

B. Functional Test

(1) Perform preceding Leak Test, Steps 4A(1) through 4A(7).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify CABIN PRESSURE CONT - AUTO - CONT (X9) circuit breaker is closed.

(3) Turn on electrical power (Ref. 24-00-00).

(4) Station observer at Flight Engineer/Second Officers position to monitor SAFETY VALVE - FWD and/or AFT valve OPEN advisory lights above CABIN PRESSURE CONTROL panel, zone 215, and ECS caution light on pilots center instrument panel caution and warning annunciator panel, zone 210. These lights must be off except when safety valve is open.

(5) With cabin safety valve main valve gate (poppet) fully closed, measure and record distance between bolt head in center of poppet and valve exterior flapper hinge point.

(6) Close static vacuum valve and record indicator reading.

NOTE: Vacuum supply must be capable of handling at least .03 lb./min. flow at 5 psia measured at flush static adapter. The pressure drop from the static adapter to the pressure gage tap shall be negligible. It is recommended that the gage be located in the sense line before it joins the servo exhaust line.

(7) Slowly open static vacuum valve to obtain minimum rate of climb, and monitor cabin safety valve poppet position.

CAUTION: DO NOT EXCEED A RATE OF CLIMB OF 5000 FEET PER MINUTE. (5 IN. HG. PER MINUTE).

(8) As soon as valve poppet begins to open, adjust static vacuum valve as necessary to hold zero rate of change.

(9) Safety valve must begin to open when tester indicator shows 17.71 to 17.91 in. Hg.

(10) As soon as valve poppet begins to open, SAFETY VALVE - OPEN light (for valve under test) must come on and ECS caution light must flash for approximately ten seconds, then remain on.

(11) Slowly open static vacuum valve until tester indicator shows 17.71 to 17.91 in. Hg.

NOTE: Test indicator should have an accuracy of ±.01 psi or ±.02 in. Hg.

(12) Adjust static vacuum valve as necessary to hold zero rate of change at 17.71 to 17.91 in. Hg.

(13) Again measure and record distance between bolt head in center of poppet and valve exterior flapper hinge point. Poppet must have opened (moved inward) at least two inches.

(14) Close static vacuum valve.

(15) Slowly open static vent valve to obtain minimum rate of descent.

(16) When tester vacuum indication decreases to 17.71 in. Hg, cabin safety valve must have begun closing and must be fully closed before vacuum indication decreases to 15.0 in. Hg.

(17) As soon as safety valve closes, SAFETY VALVE - OPEN and ECS caution lights must go off.

CAUTION: DO NOT EXCEED A RATE OF DESCENT OF 5000 FEET PER MINUTE.

(18) Slowly open static vent valve until tester indicator shows 0.0 in. Hg.

(19) Disconnect tester from flush static adapter and local port adapter.

(20) Remove flush static adapter and verify static port is free of obstruction and area around ports is clean.

(21) Remove local port adapter and verify exterior flapper of valve moves freely to full closed position.

(22) Turn off electrical power (Ref. 24-00-00).

C. Alternate Functional Test

(1) Equipment and Materials:

Air Data Tester, Model 127, Milhard Engineering, or equivalent

Cabin Pressurization Test Set

NOTE: This test is to be carried out only if unable to perform existing functional test described in section 4B.

(2) Test both forward and aft safety relief valves individually as follows:

(a) Gain access to the back of the forward or aft valves through the forward cargo compartment.

(b) Remove the filter and block the orifice with a piece of tape (Ref. 21-32-00). Attach red warning ribbon or equivalent to tape.

(c) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify CABIN PRESSURE CONT - AUTO - CONT (X9) circuit breaker is closed.

(d) Turn on electrical power (Ref. 24-00-00).

(e) Station observer at Flight Engineer/Second Officers position to monitor SAFETY VALVE - FWD and/or AFT valve OPEN advisory lights above CABIN PRESSURE CONTROL panel, zone 215, and ECS caution light on pilots center instrument panel caution and warning annunciator panel, zone 210. These lights must be off except when safety valve is open.

(f) Clean skin area around RELIEF VALVES static ports; verify ports are clean and unobstructed. Install flush static port adapter on port for valve under test (Ref. Fig. 501). Block the other port with a piece of tape and attach red warning ribbon or equivalent.

NOTE: Lower port is for aft safety valve and middle port is for forward safety valve.

(g) Open safety valve exterior flapper and install valve test fixture local port adapter in local ambient port inside valve (Ref. Fig. 501).

(h) Turn vacuum pump power switch on.

(i) Increase altitude at approximately 4000 FPM and monitor poppet position.

(j) Poppet should begin to open at 17.7 ± .2 in. Hg.

(k) Monitor opening of valve poppet. When valve poppet is open, 0.070 inch maximum, Safety Valve OPEN light (for valve under test) must come on and ECS caution light must flash for approximately ten seconds, then remain on.

(l) After valve has opened fully remove tape from the orifice and begin to decrease altitude on tester.

(m) When valve is closed, Safety Valve OPEN and ECS caution light must go off.

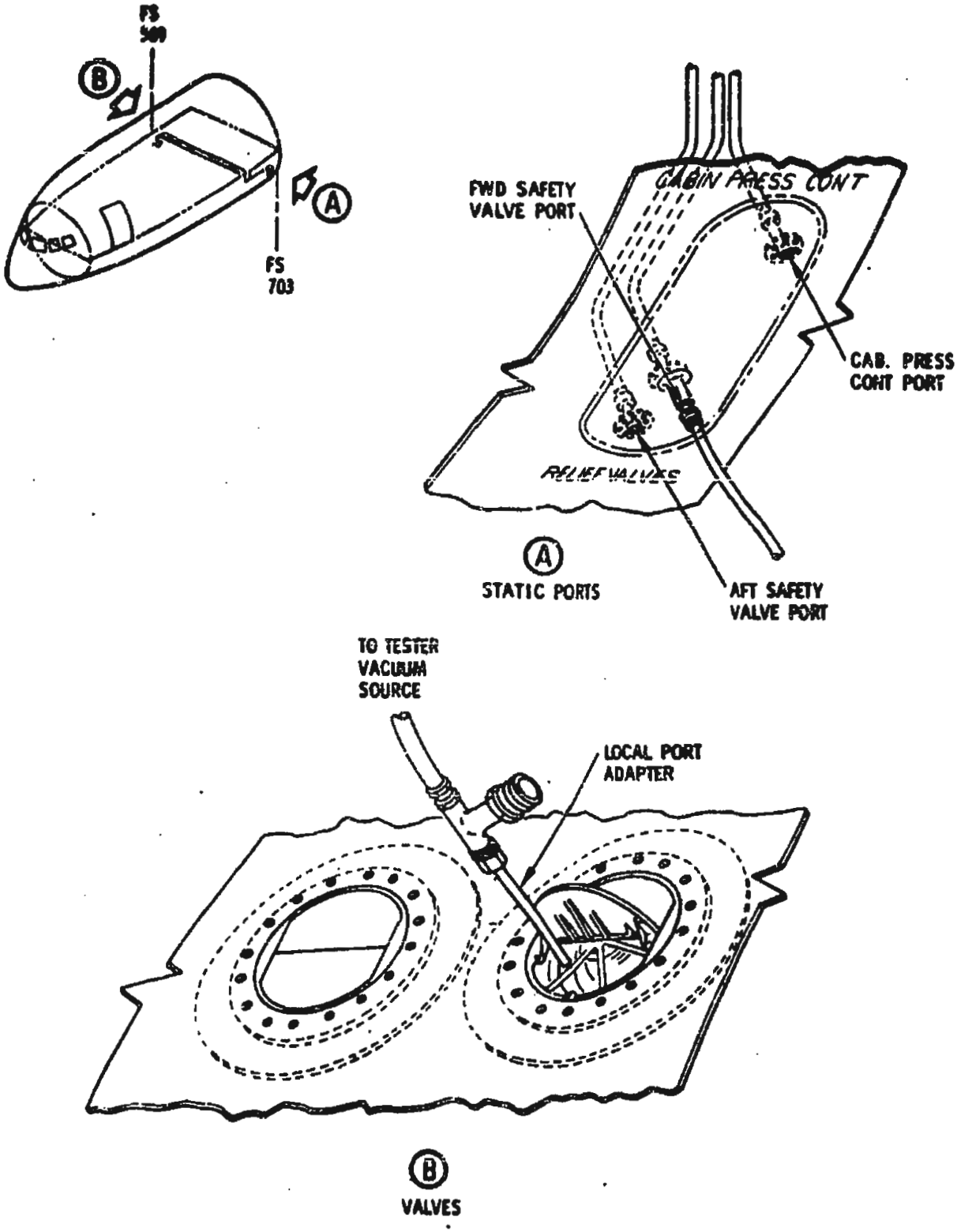
(n) Turn vacuum pump power off and disconnect static and local port adapters.

(o) Ensure tape is removed from static ports and that area around ports is clean.

(p) Verify that valve flappers are in fully closed position.

(q) Install a new filter on the back of the valve.

(r) Turn off electrical power (Ref. 24-00-00).



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C
C

Cabin Safety Valve - Test
Figure 501

R EFFECTIVITY: ALL
R
001B

CABIN SAFETY VALVES - INSPECTION AND CHECK

1. General

Inspection of the cabin safety valve filters should be made only if clogging is suspected. Under normal operation, the filter may be expected to last through the period between valve overhauls.

Check of the cabin safety valve should be made in accordance with airline time limits and whenever the cargo compartment liners are removed.

Safety valve static line condensate bottles should be checked in accordance with airline time limits.

2. Equipment and Materials

O-ring

Preformed Packing

Filter Cartridge

Silicone Oil, D.C. 200, or equivalent

3. Referenced Procedures

06-50-00	Interior Access Doors and Removable Panels - Description and Operation
21-32-06	Cabin Safety Valve Drain Bottle - Inspection and Check
25-51-06	Forward Cargo Compartment Liner - Removal and Installation

4. Inspection/Check

A. Inspection

R (1) Remove (Ref. 6-50-00) forward cargo compartment liner
R panel 122KR on forward cargo compartment liner panel
R (Ref. 25-51-06).

(2) Remove filter cover by twisting counterclockwise.

(3) Remove filter cartridge and preformed packing. Discard packing.

(4) Check filter for cleanliness. Filter may be re-used if major part of visible element appears white. If most of the visible surface is dirty, replace cartridge.

(5) Coat new preformed packing with silicone oil, and install on filter cartridge. Insert cartridge in filter housing.

(6) Ensure that spring is properly retained in filter cover, and attach filter cover to filter housing with a clockwise twisting motion.

(7) Perform check procedure in accordance with Steps 4B(2) through 4B(7).

B. Check

R (1) Check area for cleanliness.

R (2) Check safety valve electrical connectors and wiring.

R (3) Check static pressure hoses.

R R (4) Drain condensate bottles if any water is present (Ref. 21-32-06).

R R (5) Check valve gate and seat for proper seating and freedom from nicks.

R (6) Reinstall cargo compartment liner panel (Ref. 25-51-06).

NEGATIVE PRESSURE RELIEF VALVES - REMOVAL AND INSTALLATION

1. General

Two negative pressure relief valves are installed in the upper portion of the aft pressure bulkhead. One is installed on each side of the centerline, zone 280. Access is through the ceiling trim panel immediately forward of the aft lavatories. The removal and installation procedures for each valve are identical.

2. Equipment and Material

Gasket (Ref. Fig. 401)

3. Referenced Procedure

25-42-XX Lavatory Ceilings - Removal and Installation

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers upper control panel, zone 215, placard cabin pressure control panel to indicate that cabin negative pressure relief valve(s) is being removed.

(2) Lower the ceiling trim panel immediately forward of the aft lavatories (Ref. 25-42-XX).

(3) Remove screws securing negative pressure relief valve to pressure bulkhead (Ref. Fig. 401).

(4) Remove relief valve and gasket from bulkhead. Retain gasket.

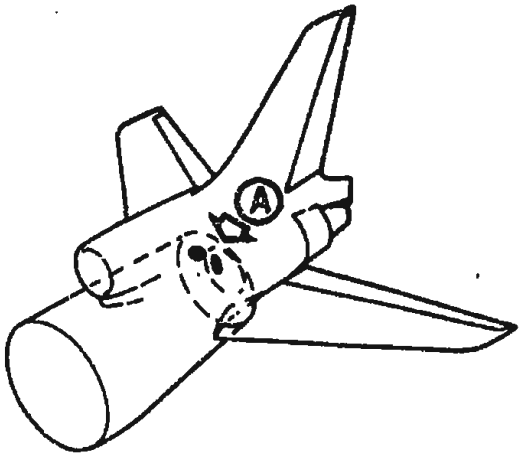
B. Installation

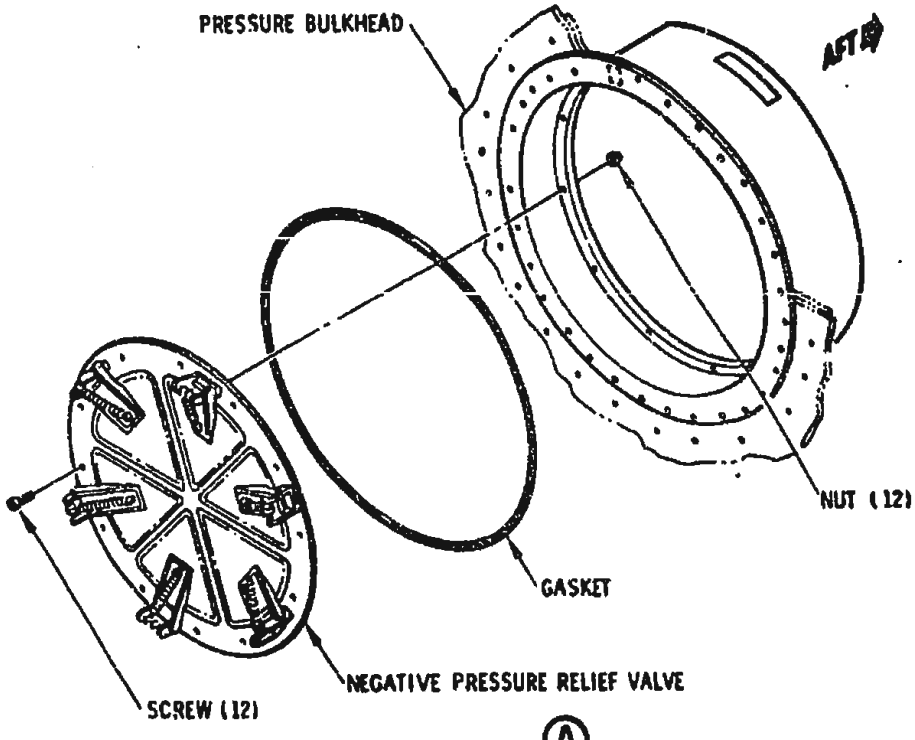
(1) Inspect old gasket. Replace gasket if damaged.

(2) Install gasket and negative pressure relief valve in bulkhead and secure with attaching screws.

(3) Close ceiling panel (Ref. 25-42-XX).

(4) Remove placard installed in Step 4A(1).





A

NEGATIVE PRESSURE RELIEF VALVE 1

NOTE

1 BOTH LEFT AND RIGHT NEGATIVE PRESSURE RELIEF VALVES ARE REMOVED AND INSTALLED IDENTICALLY

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R Negative Pressure Relief Valves - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

CABIN SAFETY VALVE DRAIN BOTTLES - REMOVAL AND INSTALLATION

1. General

The removal and installation procedures for the forward and aft cabin safety valve drain bottles are identical.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

06-50-00	Interior Access Doors and Removable Panels - Description and Operation
21-32-06	Cabin Safety Valve Drain Bottles - Adjustment and Test
25-51-06	Forward Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

R (1) Remove static drain bottle access cover 122KR (Ref.
R 06-50-00) on forward cargo compartment liner panel (Ref. 25-51-06).

(2) Loosen nut and remove screw and washer securing clamp on drain bottle to be removed (Ref. Fig. 401).

(3) Remove drain bottle from tube assembly.

B. Installation

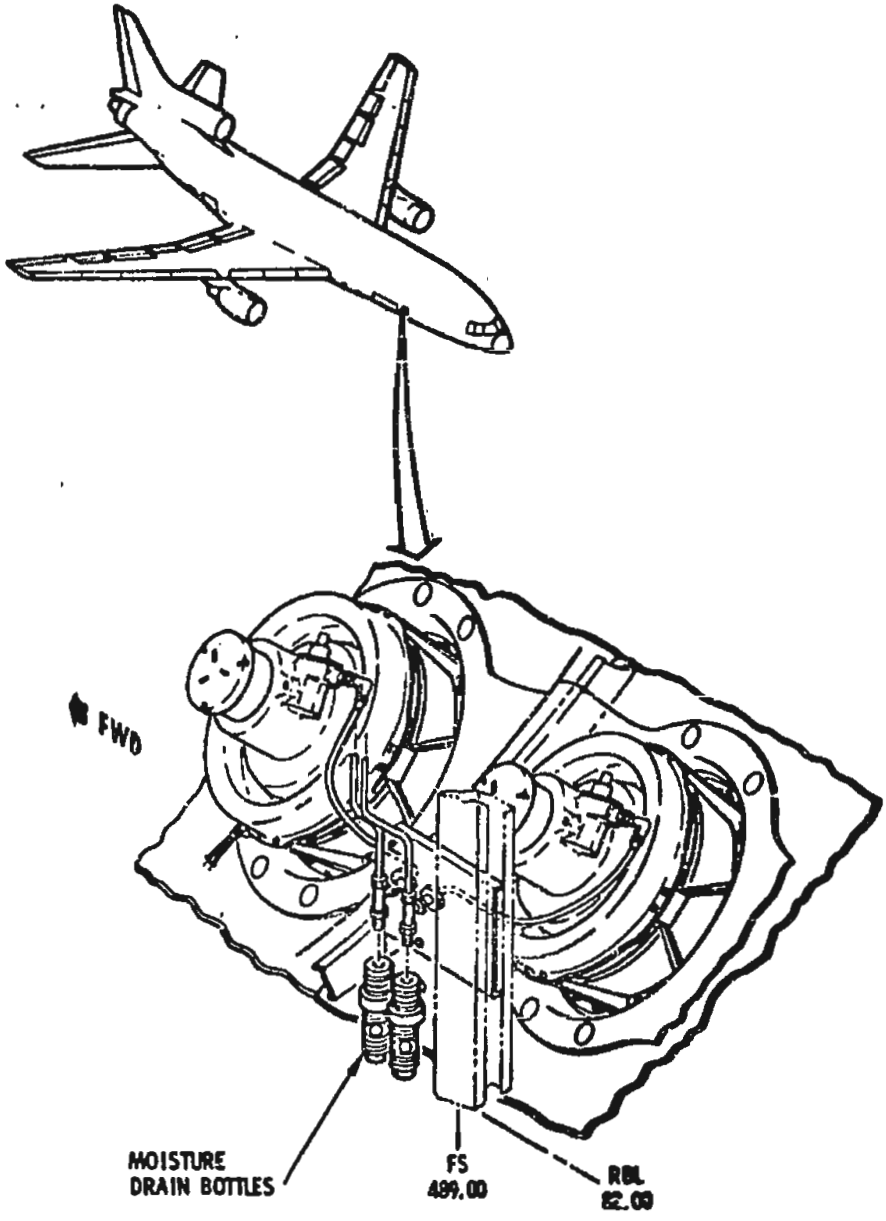
(1) Install clamp on replacement drain bottle (Ref. Fig. 401).

(2) Connect drain bottle to tube assembly.

(3) Install and secure drain bottle with screw, washer and nut at clamp.

(4) Perform drain bottle leak check procedure for bottle replaced (Ref. 21-32-06).

R (5) Install panels removed in Step 4A(1).



CABIN SAFETY RELIEF VALVES

MM-0100-21-529

R Cabin Safety Valve Drain Bottle - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

R CABIN SAFETY VALVE DRAIN BOTTLES - INSPECTION AND CHECK

R 1. General

R Safety valve static line condensate drain bottles should be
R checked in accordance with airline time limits.

R 2. Equipment and Materials

R O-ring

R Container, approximately 1/2 pint

R 3. Referenced Procedures

R	06-50-00	Interior Access Doors and Removable Panels - Description and Operation
R	21-32-01	Cabin Safety Valve - Adjustment and Test
R	25-51-06	Forward Cargo Compartment Liner - Removal and Installation

R 4. Inspection/Check

R A. Inspection

R (1) Remove static drain bottle access cover 122KR on forward cargo compartment liner panel (Ref. 25-51-06).

R (2) Check for water in drain bottles (yellow balls float to show water level).

R (3) If water is present, remove plug and O-ring at bottom of bottle and empty liquid into container.

R (4) Inspect O-ring for damage and replace if necessary.

R (5) Install plug and O-ring in bottom of drain bottle.

R (6) Perform leak test (Ref. 21-32-01).

R (7) Reinstall access panel.

INDICATING AND WARNING SYSTEMS - DESCRIPTION AND OPERATION

1. General

The indicating system (Ref. Fig. 1) indicates the cabin altitude, a cabin differential pressure, and the cabin rate of climb. A cabin altitude warning horn cutout switch is provided. Both the indicators and the cutout switch are on the Flight Engineer/Second Officers cabin pressure indication and warning panel, zone 215. The warning horn is part of the aural warning system (Ref. 31-22-00)

2. Cabin Altitude Pressure Indicator

A. Description

The cabin altitude indicator is a three-pointer indicator. The three pointers respectively indicate cabin altitude in 100, 1000, and 10,000 foot increments. A barometric set knob on the front lower left corner is used to set in barometric corrections. The setting is shown in a window at the right center of the indicator face.

Altitude range is from -1000 to 35,000 feet. Barometric range is from 27.0 to 31.0 inches of mercury and is adjusted by a face knob.

Mounted on the rear of the indicator are a port and an electrical connector. The port is open to cabin altitude. The electrical connector is used for internal lighting.

3. Cabin Differential Pressure

A. Description

The cabin differential pressure indicator is a single-pointer indicator with a range of 0 to 10 psi. Mounted on the rear of the indicator are two ports and an electrical connector. One port is open to cabin altitude. The other is connected to the aircraft static pressure system. The electrical connector is used for internal lighting.

4. Cabin Rate of Climb Indicator

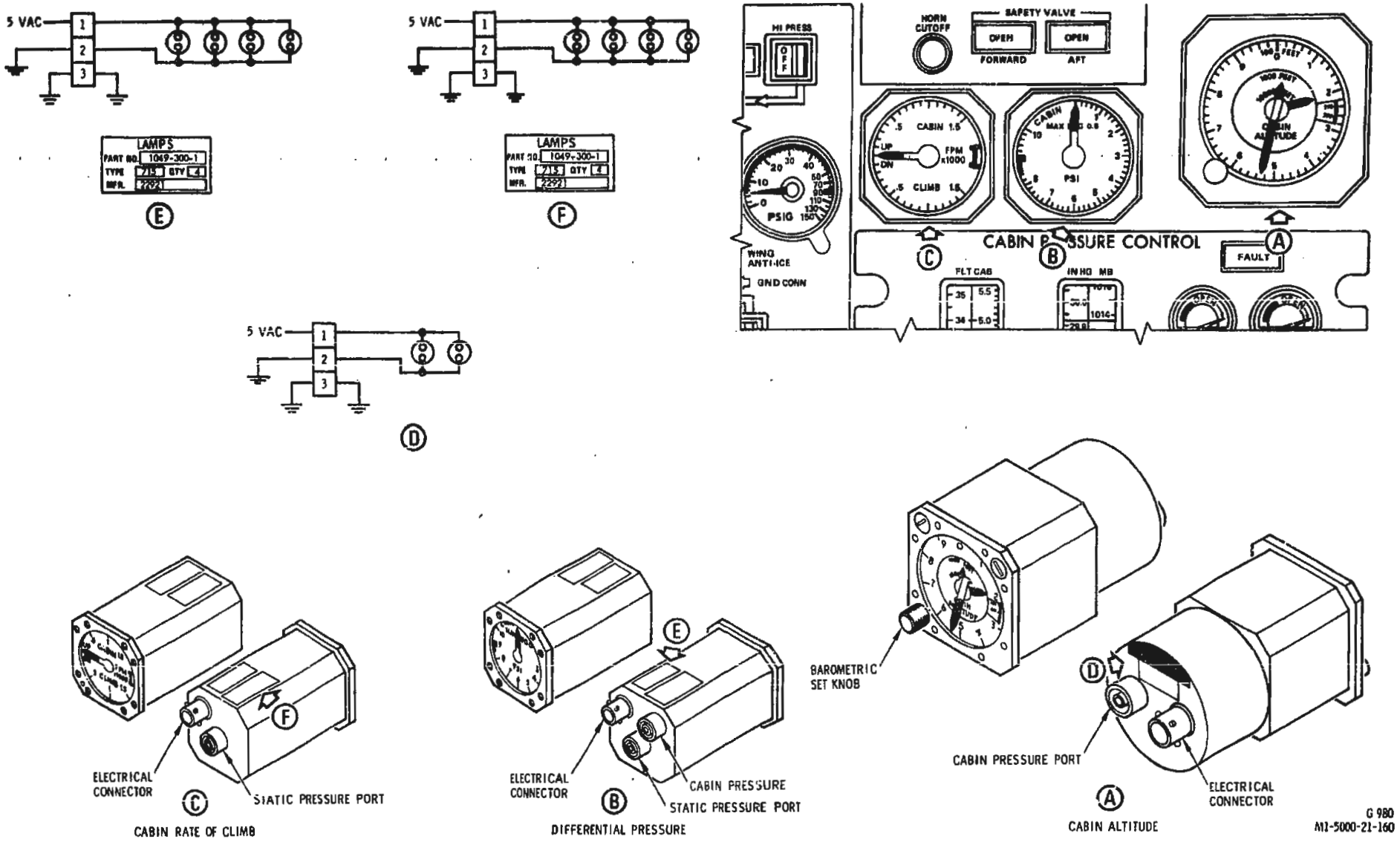
A. Description

The cabin rate-of-climb indicator is operated by changes in cabin pressure. It indicates rates of ascent or descent from 0 to 2000 feet per minute. A cabin pressure port and an electrical connector used for internal lighting are mounted on the rear of the indicator.

5. Cabin Altitude Warning Horn

A. Description

When cabin pressure decreases to an altitude equivalent to 9800 (±200) feet, a warning horn (part of the aural warning system) sounds in the flight station. The horn may be shut off by pressing the HORN CUTOUT switch (Ref. 31-22-00)



Cabin Pressure Instruments
Figure 1

INDICATING AND WARNING SYSTEM - ADJUSTMENT AND TEST

1. General

The indicating and warning system includes indicators for cabin altitude and differential pressure and cabin rate of climb, advisory lights for safety valve open indication, and a warning horn cutoff switch. These components are on the Flight Engineer/Second Officers cabin pressure indication and warning panel, zone 215.

The cabin altitude warning horn system is now part of the Aural Warning System (Ref. 31-22-00). Adjustment and test procedures for the cabin altitude warning horn are included in procedures for that system.

2. Equipment and Materials

Air Data Tester - Model 127, Milhard Engineering Co. or equivalent

Union Bulkhead - R44358P-05, Resistor Flex Corp. or equivalent

Jam Nut - R44118-05, Resistor Flex Corp. or equivalent

3. Referenced Procedures

21-32-01	Cabin Safety Valve - Adjustment and Test
34-13-00	Pitot-Static System - Adjustment and Test

4. Adjustment/Test

A. Operational Test - Cabin Altitude/Differential Pressure Indicator

(1) Check cabin altitude position of this indicator as follows:

(a) Adjust cabin altitude barometric correction knob to obtain existing field barometric pressure correction indication.

(b) Indicated altitude must be the same as actual field altitude, ±100 feet, when a cabin door is open and no air conditioning is in use.

(2) Operational test of the cabin differential pressure portion of this indicator is included as part of the procedures covering the Pitot-Static System (Ref. 34-13-00). Interconnection of static pressure reference systems precludes independent operational or functional test of this portion of the indicator.

B. Operational Test - Safety Valve Open Advisory Lights

(1) Perform functional test of cabin safety valves (Ref. 21-32-01).

C. Operational Test - Cabin Rate of Climb Indicator

(1) The cabin rate of climb indicator is operated by changes in cabin pressure. The cabin rate of climb indicator is located on Flight Engineer/Second Officers (FE/SO) control panel zone 215.

(2) On FE/SO cabin pressure control panel, remove mounting screws from control panel and slide panel outward.

(3) On rear of cabin rate of climb indicator, attach union bulkhead and jam nut adapters to cabin pressure port.

(4) Using air data tester, attach pressure vacuum source to cabin rate of climb indicator adapter.

(5) Verify electrical power is on indicator.

(6) Verify cabin rate of climb indicator pointer is on zero. Adjust zero setting with adjustment screw on face of the indicator as required.

R CAUTION: DO NOT EXCEED 2000 FEET PER MINUTE DURING ASCENDING OR DESCENDING TESTS.

(7) Apply pressure to indicator at the rate of change indicated altitude intervals listed below. The error must not exceed the tolerance specified.

STANDARD ALTITUDE INTERVAL	TEST RATE FEET/MINUTE	TOLERANCE SCALE ERROR UP	DOWN
500-2000	500	100	100
500-2000	1000	200	200
500-2000	1500	300	300

R (8) Return pressure source to ambient and disconnect air
R data tester from indicator.

R (9) Remove adapters installed in Step 4C(3).

R (10) Slide control panel inwards and secure panel with
R mounting screws, removed in Step 4C(2).

CABIN DIFFERENTIAL PRESSURE INDICATOR REMOVAL AND INSTALLATION

1. General

The cabin differential pressure indicator is mounted in the cabin pressure control panel located in the Flight Engineer/Second Officers upper panel, zone 215.

2. Referenced Procedure

34-13-00 Pitot - Static System - Adjustment and Test

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker 5 VAC FLT ENGR INSTRUMENT PANEL - UPPER - LEFT (BB11). R

(2) Loosen clamp screws securing cabin altitude and differential pressure indicator to cabin pressure control panel in FE/SO upper panel, zone 215.

(3) Pull indicator out of recess in cabin pressure control panel.

(4) Disconnect electrical plug from indicator receptacle.

(5) Disconnect static sensing line from indicator and remove indicator.

B. Installation

(1) Verify circuit breaker opened in Step 3A(1) is opened and tagged.

(2) Check O-ring between static sensing line adapter and indicator. Replace as required.

(3) Connect static sensing line to indicator.

(4) Connect electrical plug to indicator receptacle.

(5) Place indicator into recess in cabin pressure control panel, slide into position, and secure by tightening clamp screws.

R (6) Remove tag and close circuit breaker opened in Step
R 3A(1).

R (7) Perform leak check on secondary (standby) static
R system. (Ref. 34-13-00, Paragraph 4C.)

CR FUSELAGE PRESSURE AND LEAKAGE CHECK - INSPECTION/CHECK
CR MCI BASE HULL LEAK DECAY CHECK

CR 1. Mandatory Rules for Application of Pressure and Safety Precautions:

CR A. General.

CR (1) Due to the large volume of the fuselage, a potentially dangerous condition is created whenever the fuselage is pressurized. Therefore, extreme care should be taken in following this specified schedule and its safety precautions.

CR WARNING: MINIMUM OF 2 PEOPLE WILL REMAIN IN AIRCRAFT FUSELAGE WHILE FUSELAGE IS PRESSURIZED. PERSONNEL SHALL NOT ENGAGE IN PRESSURIZATION IF AFFLICTED WITH HEAD COLD, ASTHMA, OR BRONCHIAL TROUBLES.

CR (2) Voice communications must be maintained between personnel inside the fuselage and personnel operating the Ground Air Source.

CR (3) The air pressure applied to fuselage under pressure should not exceed 1500 ft/max. as indicated on the cabin rate of climb indicator (ship's instrument). The rate of decompression should not exceed 2000 ft/max. as indicated on ship's cabin rate of climb indicator.

CR NOTE: Rate of Climb and Rate of Decompression is at comfort of personnel.

CR Only properly authorized personnel shall operate the aircraft controls for this test.

CR 2. Test Equipment:

CR 2 or more Ground Air Start Systems (Facility)

CR APU Normal Mode (Alternate Source)

CR Differential Pressure Gage 0-20 PSI

CR 115/208 ± 4 VAC, 30, 400 ± 20 Hz, Grd. Power.

CR Stop Watch

CR NOTE: Verify that calibration decals are current on Test
CR Equipment. If not, notify Test Services prior to
CR performing this test.

CR 3. Test Conditions

CR A. All primary structure must be complete and accepted by
CR Inspection before Fuselage is subjected to pressure.

CR B. All normally installed equipment that vents to outside
CR should be in the configuration of Chart I.

CR C. All doors and other openings that depend on mechanical seals
CR for pressure tightness shall be closed in a normal manner.

CR CAUTION: NO TEMPORARY CLAMPS, CLOSURE STRIPS, SEALANTS,
CR ADJUSTMENTS OF DOOR SEALS AFTER CLOSING OF DOORS OR
CR OTHER MEANS SHALL BE USED TO REDUCE LEAKAGE THROUGH
CR MECHANICAL SEALS DURING LEAKAGE CHECK.

CR D. Close the circuit breakers in Figure 601 to aid in operating
CR the valves to closed and open position in the following
CR paragraphs.

CR NOTE: The above requirement is required for Ground Air
CR Start, Air Pressure.

CR E. Assure the following valves are closed:

CR 3 ea Engine Isolation Valves

CR 2 ea Wing Anti-Ice Valves (L & R)

CR 1 ea FESC Exhaust Valve

CR 1 ea Galley Exhuast Valve

CR 1 ea MESC Exhaust Valve

CR 2 ea A.T.M. Valves

CR 1 ea APU Shutoff Valve

CR F. Assure the following valves in aircraft are selected to open
CR position:

CR 2 ea * Duct Isolation Valves (cross bleed)

CR 3 ea * Pack Flow Control Valves

CR 2 ea Cabin Outflow Valves (Fwd & Aft)

CR 5 ea Zone Trim Valves (Open by Setting Zone Controls to Full Warm)

CR 2 ea * Hot Air Control Valves

CR 2 ea * Hot Manifold Isolation Valves

CR 3 ea Turbine By-Pass Valves

CR * NOTE: Valves require air to open.

CR G. Ship shall not be pressurized during any portion of this test when ship is supported by jacks. It is recommended that jacks be clear of jack pads by a radius distance of 12 inches.

CR H. Cabin Safety Valves plumbing should be complete.

CR I. Remove from aircraft, the following parts and cap lines before pressurizing:

CR 1 ea Cabin Press Controller

CR 1 ea Cabin Differential Pressure Cage

CR 1 ea Stand-by Cabin Altimeter P.N - Aero Mechanism 8048-1 (Mode 193K only)

CR 1 ea 2 in. Standby Air Speed Indicator-Aero Mechanism 8095-2

CR 1 ea 2 in. Standby Altimeter - Aero Mechanism 8047-10

CR 2 ea Air Data Computers - Sperry - 2593200-901; - 2593200-902

CR 4 ea Pitot Boom Covers, Ascertain that all ports are open.

CR NOTE: Verify that all the static lines are capped inside aircraft before pressurizing. A loose or missing cap will give a false indication on test gage during pressure checks.

CR 4. APU Air Source

CR A. An APU can be used for an alternate air source. The APU is to be operated by authorized personnel only and in accordance with normal APU Ground Operating Procedure. If the APU is to be used as the alternate Air Source, the circuit breakers in Figure 602 are to be engaged: (See Note below)

CIRCUIT BREAKER	PANEL
Cabin Press Auto Control	CB3 (X-9)
ECS Ind Lt	CB3 (G-12)
Bleed Air Ind	CB3 (R-17)
ECS Air Temp Ind	CB3 (V-1)
Pack Flow Ind	CB3 (V-2)
Temp Cont Flt Sta DC	CB3 (V-3)
Temp Cont Flt Sta AC	CB3 (V-4)
Pack 1 Auto/Man DC	CB3 (V-5)
Pack 1 Auto/Man AC	CB3 (V-6)
Pack 2 Auto/Man DC	CB3 (V-7)
Pack 2 Auto/Man AC	CB3 (V-8)
Zone Temp Cont Fwd Cab DC	CB3 (V-9)
Zone Temp Cont Fwd Cab AC	CB3 (V-10)
Zone Temp Cont Mid Cab DC	CB3 (V-11)
Zone Temp Cont Mid Cab AC	CB3 (V-12)
Zone Temp Cont Aft Cab DC	CB3 (V-13)
Zone Temp Cont Aft Cab AC	CB3 (V-14)
Zone Temp Cont Galley DC	CB3 (V-15)
Zone Temp Cont Galley AC	CB3 (V-16)
Pack 3 Auto/Man DC	CB3 (V-17)
Pack 3 Auto/Man AC	CB3 (V-18)
Hot Air Man Ind	CB3 (W-5)
Hot Air Man Temp Cont	CB3 (W-6)
Hot Air Man Isln No. 2	CB3 (W-7)
Hot Air Man Isln No. 3	CB3 (W-8)
Engine Bleed Cont Eng Isln Valve Eng 1	CB1 (G-10)
Engine Bleed Cont Eng Isln Valve Eng 2	CB1 (G-11)
Engine Bleed Cont Eng Isln Valve Eng 3	CB1 (G-12)
Engine Bleed Cont HI Press Valve Eng 1	CB1 (G-13)
Engine Bleed Cont HI Press Valve Eng 2	CB1 (G-14)
Engine Bleed Cont HI Press Valve Eng 3	CB1 (G-15)
Engine Bleed Control Fus Isln Valve	CB1 (G-16)
Engine Bleed Control Cross Bleed Valve L	CB1 (G-17)
Engine Bleed Control Cross Bleed Valve R	CB1 (G-18)
Envir Cont Sys Pack Flow Control 1	CB1 (H-3)
Envir Cont Sys Pack Flow Control 2	CB1 (H-4)
Envir Cont Sys Pack Flow Control 3	CB1 (H-5)
Envir Cont Sys Pack Flow Cont	CB1 (H-6)
Air Ovhd	CB1 (J-14)
Wing Anti-Ice Cont	CB2 (D-22)
Outflow Valve Fwd	CB3 (X-14)
Outflow Valve Aft	CB3 (X-17)
Envir Control Sys Manual Cabin Press Cont. Fwd	CB1 (H-1)
Envir Control Sys Manual Cabin Press Cont. Aft	CB1 (H-2)

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CR
CR

Engaged Circuit Breakers
Figure 601

R
R
001B

EFFECTIVITY: ALL

CR B. Basic Set-up

CR (1) Connect 0-20 PSI Differential Gage or equivalent to
CR Flight Engineer's Static System.

CR NOTE: Line removed from aircraft differential gage can
CR be used. Use gage removed from aircraft.

CR (2) Connect Ground Air Start Lines to aircraft or start
CR APU.

CR (3) Verify all doors are closed and locks are secured
CR except door used for entrance to aircraft for
CR pressurization.

CR (4) Verify the conditions of airframe by using Figure 603
CR to establish the leakage rate that will determine the
CR time to decay during the following test.

CR C. Test Requirements and Procedures

CR (1) With authorized personnel aboard aircraft and entrance
CR closed and secured, preceed with the following
CR requirements.

CR (2) Slowly open ground air supplies or APU shutoff valve.
CR Allow air in cabin to stabilize after the initial
CR surge.

CR (3) Slowly modulate the Cabin Manual Pressure Controls on
CR the Cabin Pressure Control Panel (both the Fwd and Aft
CR valves) toward the closed position.

CR (4) Monitor the Cabin Rate of Climb to a rate not to exceed
CR 1500 FPM while pressurizing the fuselage.

CR (5) Monitor Cabin Differential Test Gage as fuselage
CR pressure reaches 16.30" Hg. Lower the Rate of Change of
CR fuselage pressure to 300 FPM so monitoring of safety
CR valve relief can be noted and recorded. The Safety
CR Relief Valves Crack at 8.75 ± .05 PSI or 17.75" to
CR 18.00" Hg. Record Safety Valve setting.

CR NOTE: Test must be conducted to make both valves open
CR (to check each valves' operation). This can be
CR done on outside of aircraft by checking
CR discharge louvers of safety valves. Verify that
CR both safety valve warning lights operate during
CR this check. If both valves do not open when
CR using APU, hold louvers closed on opened valve
CR until other valve starts to open.

CIRCUIT BREAKER	PANEL
*APU Tank Valve & Pump	CB3 (S-14)
Firewall Shut-off Pri	CB3 (S-7)
Fire Detector Test	CB1 (J-5)
Firewall Shut-off Sec	CB3 (S-8)
Battery Charger	CB3 (B-15)
APU Power Control	CB3 (S-13)
APU Gen Control Unit	CB3 (B-17)
APU Bat. Pwr.	CB3 (B-10)
T/R Power	CB3 (B-11)
Control & Pri F/W Sov (Grd Bus - Ref)	CB3 (B-15)
Control & Pri F/W Sov (Bus - Ref)	CB3 (B-16)
ATM Pump Cont & Ind. Sys "B"	CB2 (L-13)
Fuel Tank Valve APU (Firewall)	CB1 (D-13)
ATM Pump Cont & Ind Sys "C"	CB2 (L-19)
*Tank Vale APU (Emerg)	CB1 (D-15)
Fire Detection Master Alarm Pwr	CB1 (D-18)
APU Sec Emer Shut-off	CB1 (J-8)
APU Fire Shutdown	CB1 (J-7)
APU Controller Bus 2	CB3 (B-13)
Alarm Loop A	CB1 (D-16)
APU Controller Gnd Bus	CB3 (B-14)
Alarm Loop B	CB1 (D-17)
APU Cont. Pwr	CB3 (S-12)
Fus. Isln/Valve	CB1 (G-16)
*F/E Ind. Lt. Test Bus 4	CB2 (H-4)
*Ind. Lt. F/E Panel Lower	CB2 (J-4)
*Ind. Lt. F/E Panel Upper	CB2 (J-3)
*MLG Gnd Sense	CB2 (L-8)
*Prox. Sw Pwr No. 1	CB1 (L-10)
*Prox. Sw Pwr No. 4	CB1 (L-11)
*Master Alarm Pwr. APU	CB1 (J-4)
*Firebell Power	CB1 (J-6)
*APU Fire Shutdown	CB1 (C-18)
*Fire Detection Loop "A" APU	CB1 (K-4)
*Fire Detection Loop "B" APU	CB1 (K-5)
*APU Fire Horn	CB3 (S-6)
Inlet Door	CB3 (S-9)
Ignition	CB3 (S-11)
Ejector & Vent Valve	CB3 (S-15)
*APU Bleed Air Valve	CB3 (S-18)

* Identifies circuits energized in primary support of the APU as well as those of a secondary nature such as fire protection, etc.

NOTE: Fuselage Isolation Valve (aft) will have to be opened when APU is used for pressurization air supply.

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CR
CR

Engaged Circuit Breakers
Figure 602

R EFFECTIVITY: ALL
R
001B

CR (6) Shut down or close Air Supply to aircraft.

CR (7) Monitor the differential gage as pressure starts its
CR decay. When differential gage reaches 8.0 PSI (16.30"
CR Hg.) start timing the decay to 7.0 PSI or (14.30" Hg).
CR Decay rate shall meet the minimum requirements of
CR Figure 604.

CR NOTE: Cabin Temperature should be checked before decay
CR check to assure the correct curve on Figure 604
CR is used for decay rate determination.

CR (8) After Decay Check has been made, relieve the cabin
CR pressure using outflow valve controls but not to exceed
CR 2000 FPM as indicated on Cabin Rate of Climb Indicator.

CR (9) Return aircraft equipment and valve positions to
CR pre-test configuration. Open all circuit breakers
CR closed, if not required for additional test.

BASIC FUSELAGE — Including doors, windows, cable seals, electrical penetration, high pressure duct and valve leakage, and ACM.	168 lb/min
If any of the following are blocked off, the leakage allowance given below should be subtracted from the above basic leakage allowance:	
Lavatory vents (forward and aft) normal	27.2 lb/min
Cabin pressure control valves (2) — closed	22.1 lb/min
Cabin pressure safety valves (2) — normal closed	.57 lb/min
Cabin inflow relief valves (2) — normal closed	.43 lb/min
Fwd electronic cooling system — closed	2.41 lb/min
Main electrical service center cooling system —closed	2.2 lb/min
Water drain systems (3) — normal	23.8 lb/min
Galley vent system (1) — closed	2.2 lb/min.

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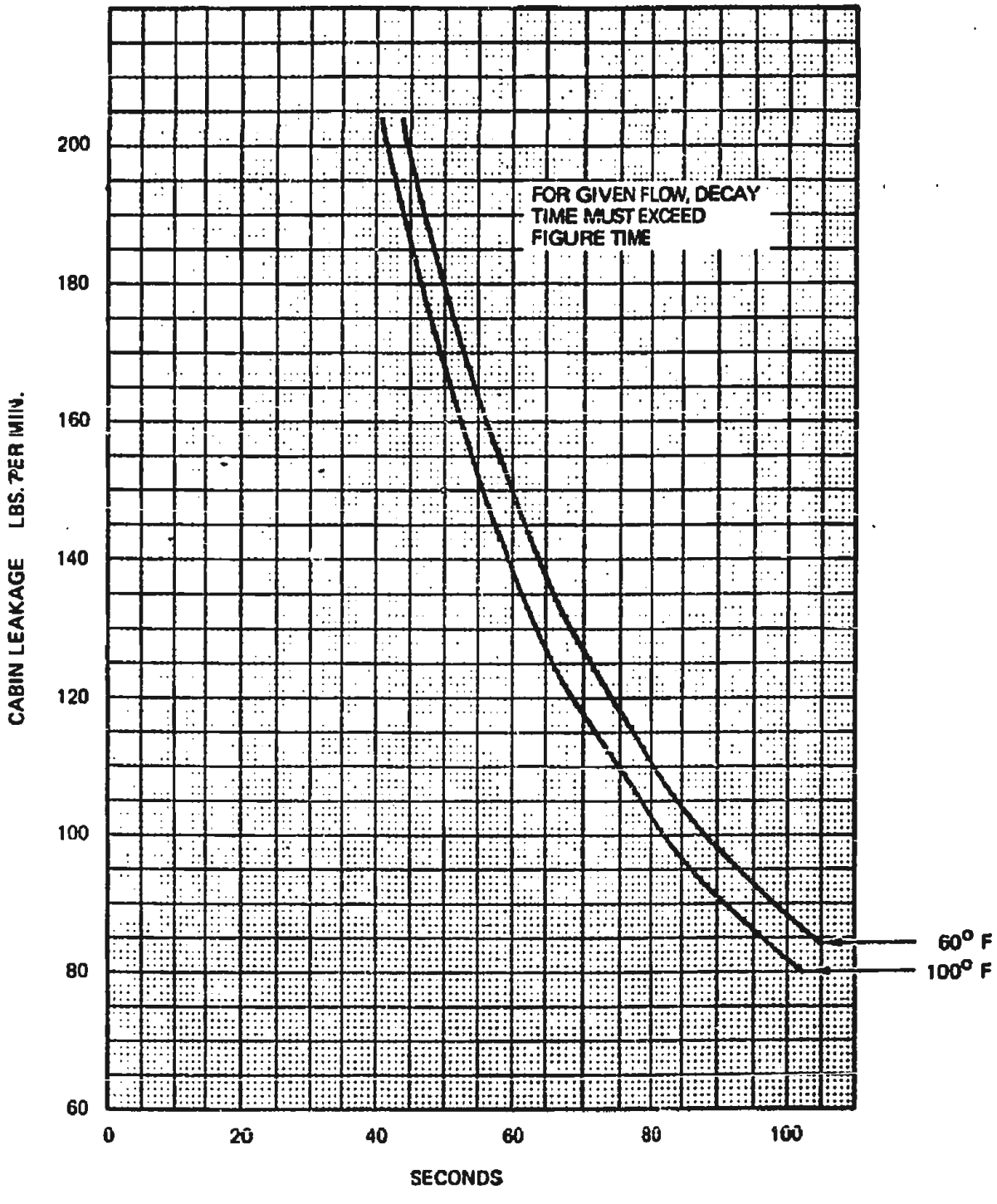
CR Leakage Allowance for 8.0 to 7.0 PSI or (16.30" to 14.30" EF) decay
CR at FMD
CR Figure 603

R EFFECTIVITY: ALL
R
0018



CR
CR TIME TO DECAY 1 PSI or 2.04 INCHES HG.
Figure 604

R EFFECTIVITY: ALL
R
001B

HEATING - DESCRIPTION AND OPERATION

1. General

This section describes the hot air manifold system, the wall heat system, the floor heat system, and the cargo heat systems.

The hot air manifold system (Ref. 21-41-00) provides hot, temperature-controlled air to the zone trim control system (Ref. 21-61-00) portion of the temperature control system.

Air for the hot manifold is taken from the No. 2 and No. 3 air cycle packs; from upstream of each primary heat exchanger through a hot manifold temperature control valve; and from downstream of each primary heat exchanger. The mixture of uncooled and partially cooled air from each pack is controlled to maintain individual system discharge temperatures at 230 (±20) degrees F (110 degrees C).

The wall heat system (Ref. 21-42-00) warms the cabin walls by downward movement of cabin air taken from below the storage modules. The air passes between the interior walls and the insulated fuselage skin to near the floor. This air reenters
R the cabin exhaust grills, and then exhausts through that system.

The floor heat system (Ref. 21-43-00) includes electrically heated panels in the center portion of the cabin. Heated cabin floor panels over the wing center section, the main landing gear wheel wells, and the hydraulic service center compensate for heat loss through those areas (FS 983 to 1363). In the flight station hot air is blown over the pilots feet.

The cargo heat systems (Ref. 21-44-00) maintain a minimum compartment air temperature of 50 degrees F by fan-forced recirculation of cargo air through heat exchangers in the bleed air and air cycle pack ducting.

HOT AIR MANIFOLD SYSTEM - DESCRIPTION AND OPERATION

1. General

The hot air manifold system consists of two functionally identical systems. Each system has the following major components (Ref. Fig. 1).

Temperature control valve (electrically controlled, pneumatically operated)

Temperature control sensor

Mixing check valve

Isolation valve (electrically controlled, pneumatically operated)

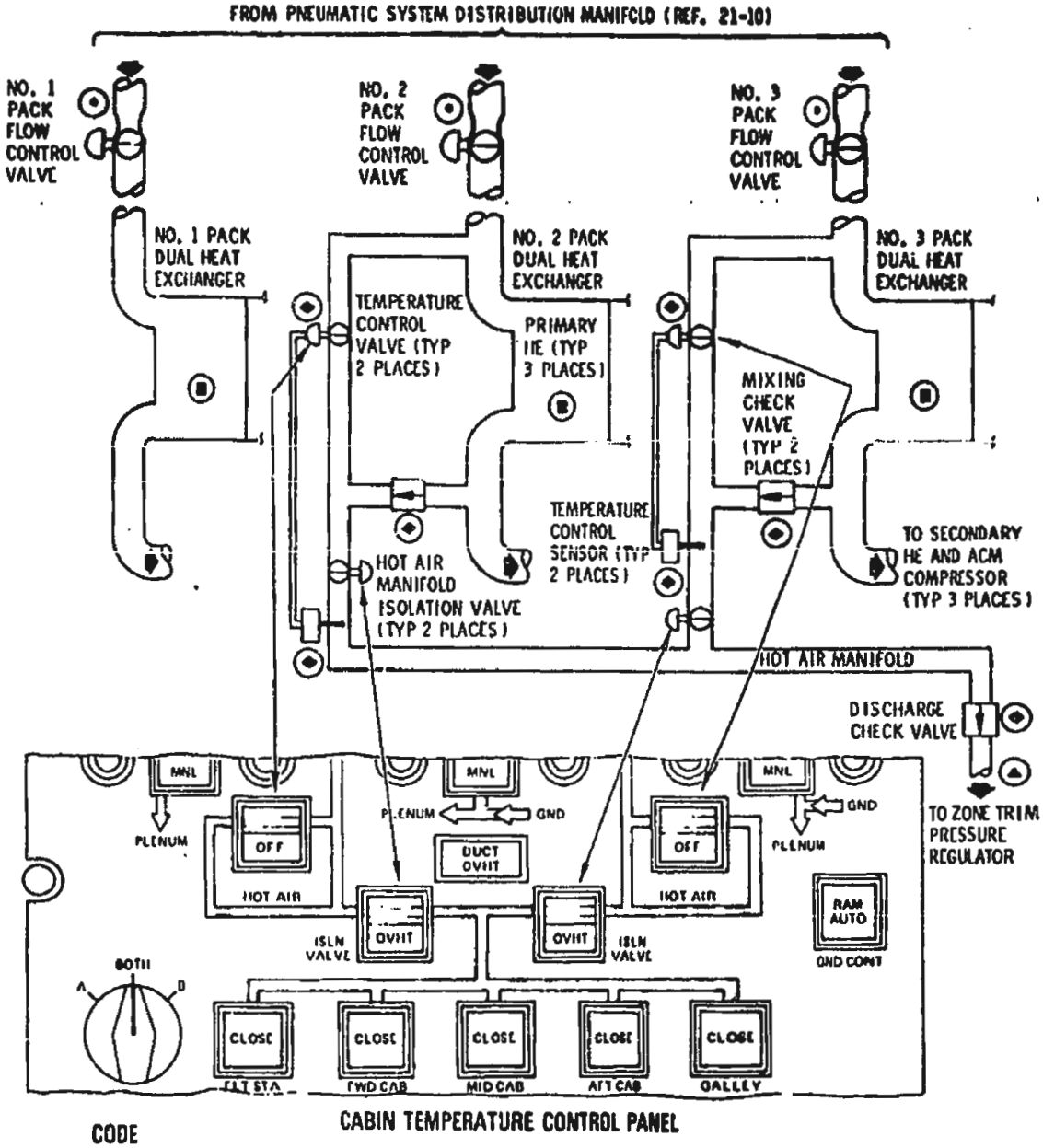
HOT AIR switchlight (Press-on/press-off for on-off control of the temperature control valve)

ISLN VALVE switchlight (Press-on/press-off for on-off control of the isolation valve)

One system takes air from the No. 2 pack and the other from the No. 3 pack. In each system, uncooled air from upstream of the dual heat exchanger is mixed with partially cooled air from downstream of the primary section of the dual heat exchanger. The ratio of uncooled to cooled air is determined by how far the temperature control valve in the uncooled air duct opens. The opening of the valve is controlled by the temperature control sensor, located downstream of the air mixing point. The sensor
CR controls the valve to maintain an air temperature of 235 ± 30
CR degrees F (112 ± 16 degrees C) at the sensor. The temperature-controlled air from each system passes through an isolation valve and to a common manifold duct (Ref. Fig. 2). From the manifold, the air goes to the zone trim system through the hot air manifold discharge check valve (Ref. 21-61-00).

On-off control for each supply system is provided by the HOT AIR switchlights on the Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215. Interlock circuits prevent the temperature control valves from opening unless the associated pack flow control valve is open.

The mixing check valve in each supply system cooled air duct prevents uncooled air from bypassing the dual heat exchanger when the system is isolated from the hot air manifold, or when the zone trim air requirements are low.



CABIN TEMPERATURE CONTROL PANEL

CODE

- SUPPLY SYSTEM (REF. 21-20-00)
- HOT AIR MANIFOLD SYSTEM (REF. 21-41-00)
- AIR CYCLE SYSTEM (REF. 21-51-00)
- ZONE TRIM SYSTEM (REF. 21-61-00)

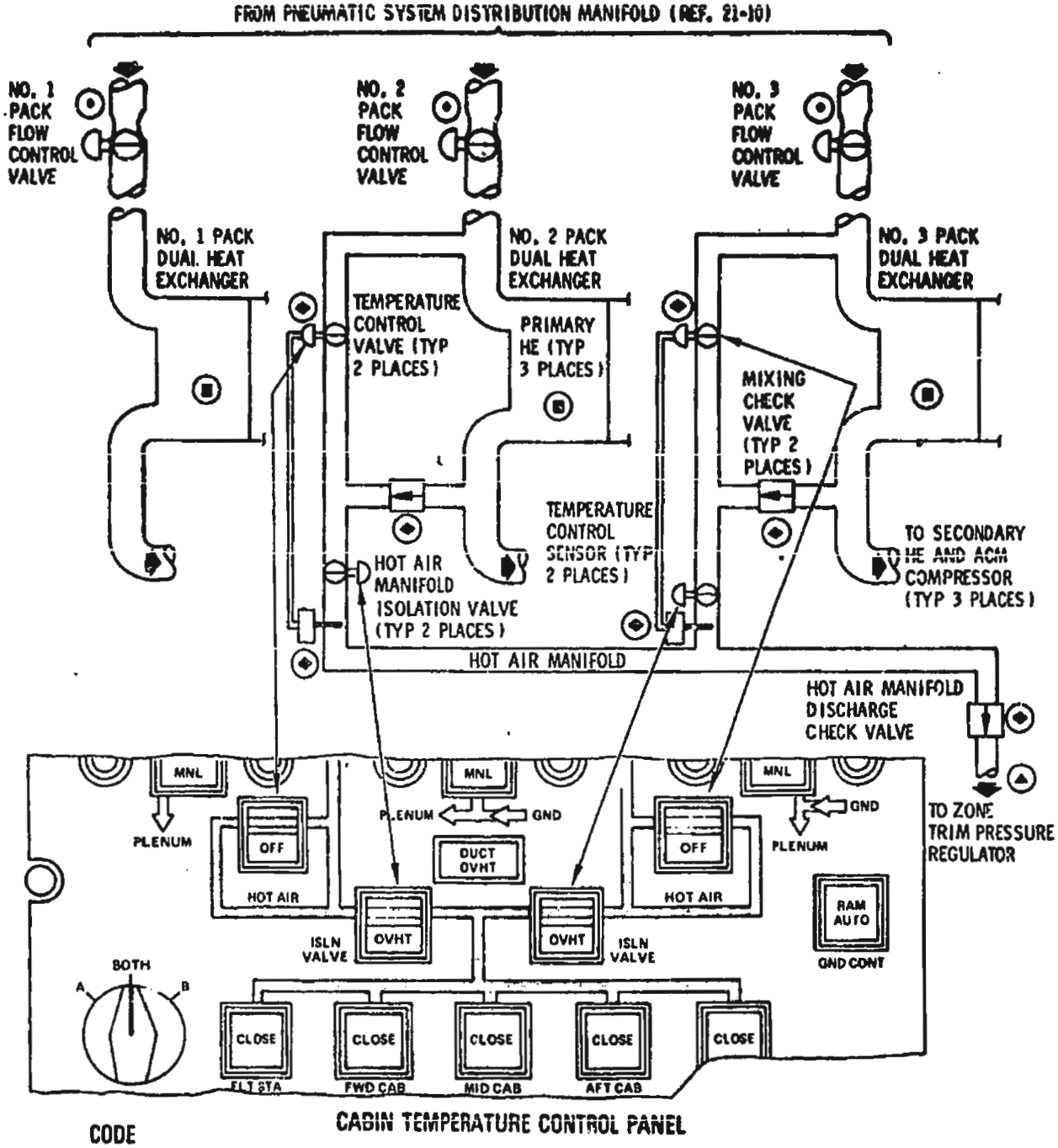
M1-0003-21-030

R
R

Hot Air Manifold System Schematic
Figure 1

EFFECTIVITY: 001-023 WITHOUT SB21-077

001B



CABIN TEMPERATURE CONTROL PANEL

CODE

- SUPPLY SYSTEM (REF. 21-20-00)
- HOT AIR MANIFOLD SYSTEM (REF. 21-41-00)
- AIR CYCLE SYSTEM (REF. 21-51-00)
- ZONE TRIM SYSTEM (REF. 21-61-00)

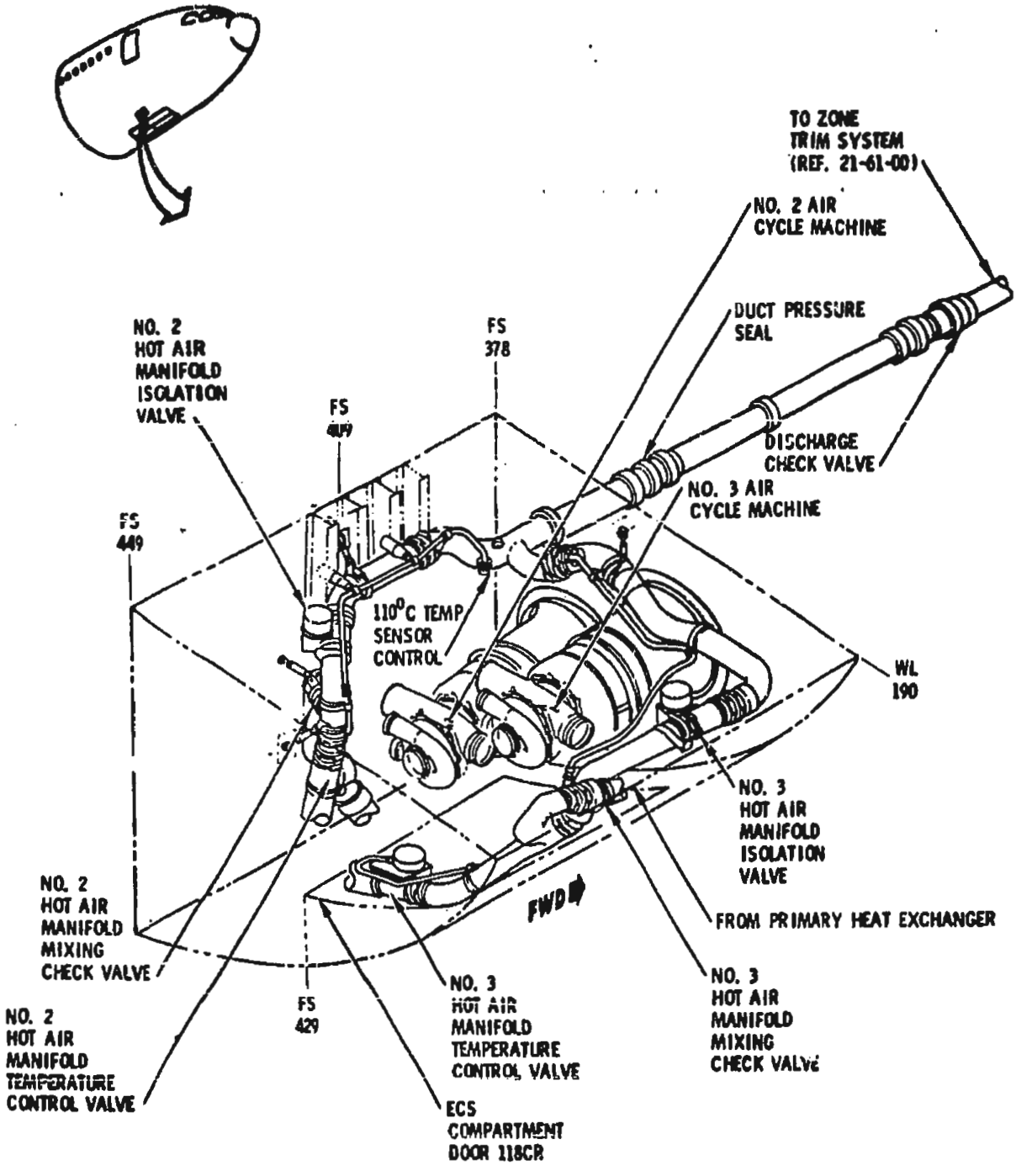
M1-0002-21-036

R
R

Hot Air Manifold System Schematic
Figure 1

EFFECTIVITY: 001-023 WITH SB21-077, AND 024-999

001B


TO ZONE TRIM SYSTEM (REF. 21-61-00)
NO. 2 AIR CYCLE MACHINE
DUCT PRESSURE SEAL
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
FS 378
FS 409
DISCHARGE CHECK VALVE
NO. 3 AIR CYCLE MACHINE
FS 449
110°C TEMP SENSOR CONTROL
WL 190
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE
FWD
FROM PRIMARY HEAT EXCHANGER
NO. 2 HOT AIR MANIFOLD MIXING CHECK VALVE
NO. 2 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
FS 429
NO. 3 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
NO. 3 HOT AIR MANIFOLD MIXING CHECK VALVE
ECS COMPARTMENT DOOR 118CR

M1-0002-21-037

Hot Air Manifold
Figure 2

Either supply system may be isolated from the manifold by closing the isolation valve.

Lockout relays are provided in both systems to control the temperature control and isolation valves in the event of certain overheat conditions.

2. Operation

Both systems operate in the same manner. With the pack flow control valves open and pneumatic pressure available, the temperature control valves close if the solenoids are energized and open if the solenoids are deenergized.

Releasing the HOT AIR switchlight to the off (out) position applies power from the HOT AIR MANF - TEMP - CONT circuit breaker (Ref. Fig. 3) to the solenoid of the temperature control valve and to the coil of the hot air manifold temperature control valve indicator relay.

The valve closes and the valve limit switch provides a ground for the indicator relay, which energizes and removes power from the flow bar light circuit. A set of contacts in the switchlight provide power to the OFF indicator light.

Depressing the switchlight breaks the circuits to the valve solenoid, the indicator relay coil, and the OFF light, and establishes a ground circuit for the coil of the hot air manifold temperature control valve lockout relay.

The temperature control valve opens, which opens the closed limit switch. The indicator relay deenergizes and completes the circuit for the flow bar light. The flow bar light comes on and the OFF light goes off.

The temperature control valve initially opens fully, and supplies a large quantity of hot air to the manifold. As the temperature at the sensor increases, the sensor modulates the control pressure in the valve actuator and the valve moves toward close. The sensor controls the valve position to maintain the desired temperature.

Releasing the HOT AIR switchlight to the off (out) position shuts down the system.

Emergency shutdown is provided by the lockout relays. When one of the relays is energized, it establishes its own hold-in circuit and applies power to the associated temperature control valve solenoid, which closes the valve. The lockout relay remains energized until the HOT AIR switchlight is placed in the off position or until power is removed from the control circuit.

The lockout relays may be energized in several ways. An overtemperature signal from the hot air manifold duct overtemperature switch (Ref. 21-41-19), located in the duct downstream of the hot air manifold discharge check valve, energizes the temperature control valve lockout relays in both systems. The No. 2 and No. 3 PACK FLOW CONTROL switchlights energize the corresponding lockout relays when placed in the off position. Any of the pack flow valve automatic override signals will also energize the lockout relay.

The two hot air manifold isolation valves are controlled by the ISLN VALVE switchlights on the CABIN TEMP CONTROL panel (Ref. Fig. 4). These valves are also electrically controlled and pneumatically operated. Loss of pneumatic pressure or solenoid power closes the valve.

With the ISLN VALVE switchlight in the off (out) position, the circuit from power source to the valve solenoid is opened, the valve is closed, and the circuit to the flow bar light is broken by the valve limit switch. Depressing the switchlight completes the circuit to the valve solenoid and provides a ground for the coil of the hot air manifold isolation valve lockout relay. As the valve opens, the limit switch completes the indicator light circuit, and the flow bar light in the switchlight comes on.

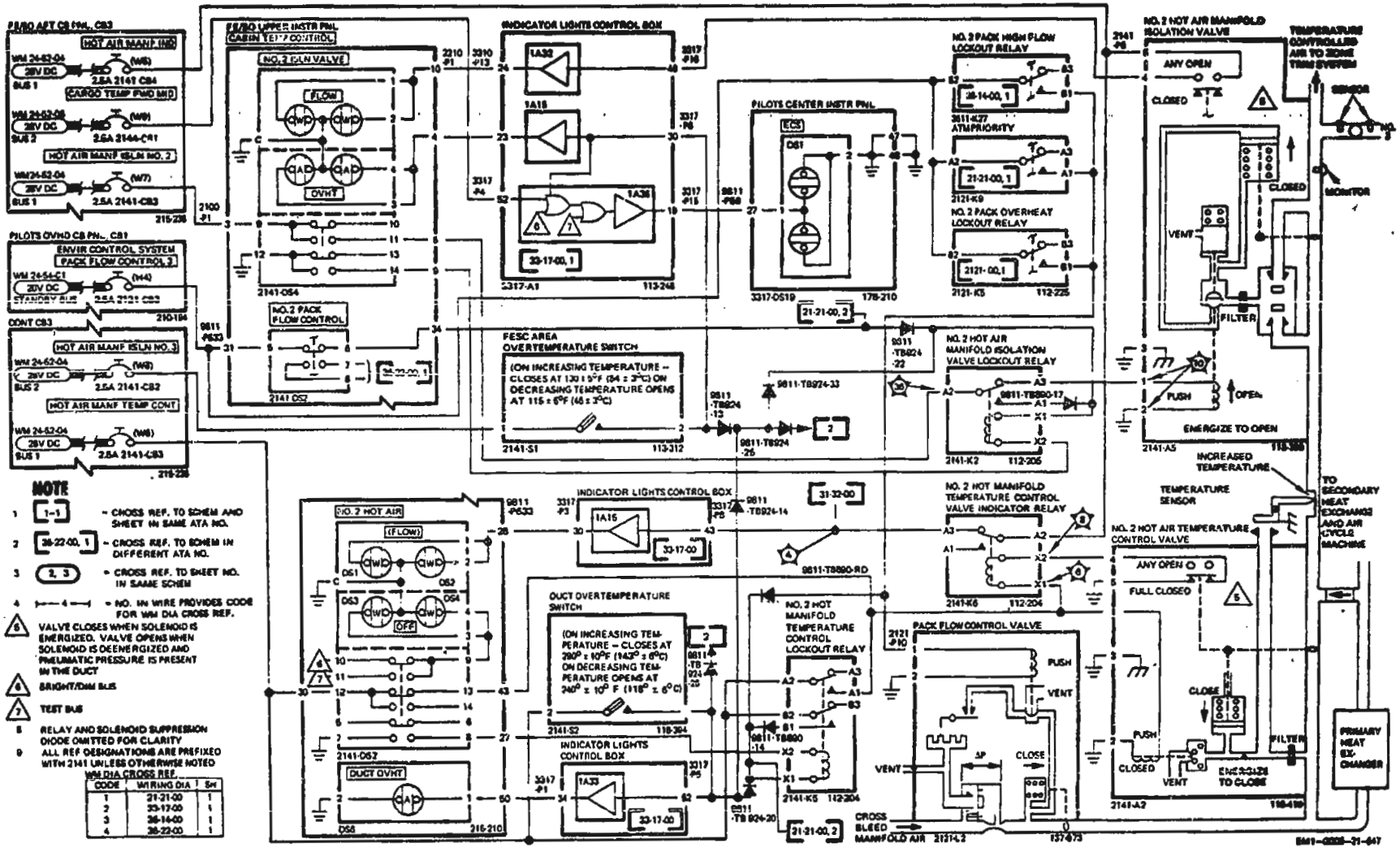
The signals from the pack flow control valves which energize the temperature control valve lockout relays also energize the isolation valve lockout relays. A signal from the forward electronic service center area overtemperature switch (Ref. 21-41-20) will energize both isolation valve lockout relays. Once energized, the lockout relays remain energized until the corresponding ISLN VALVE switchlight is released to the off position, or until power is removed from the system.

3. Hot Air Manifold Temperature Control Valve

A. Description

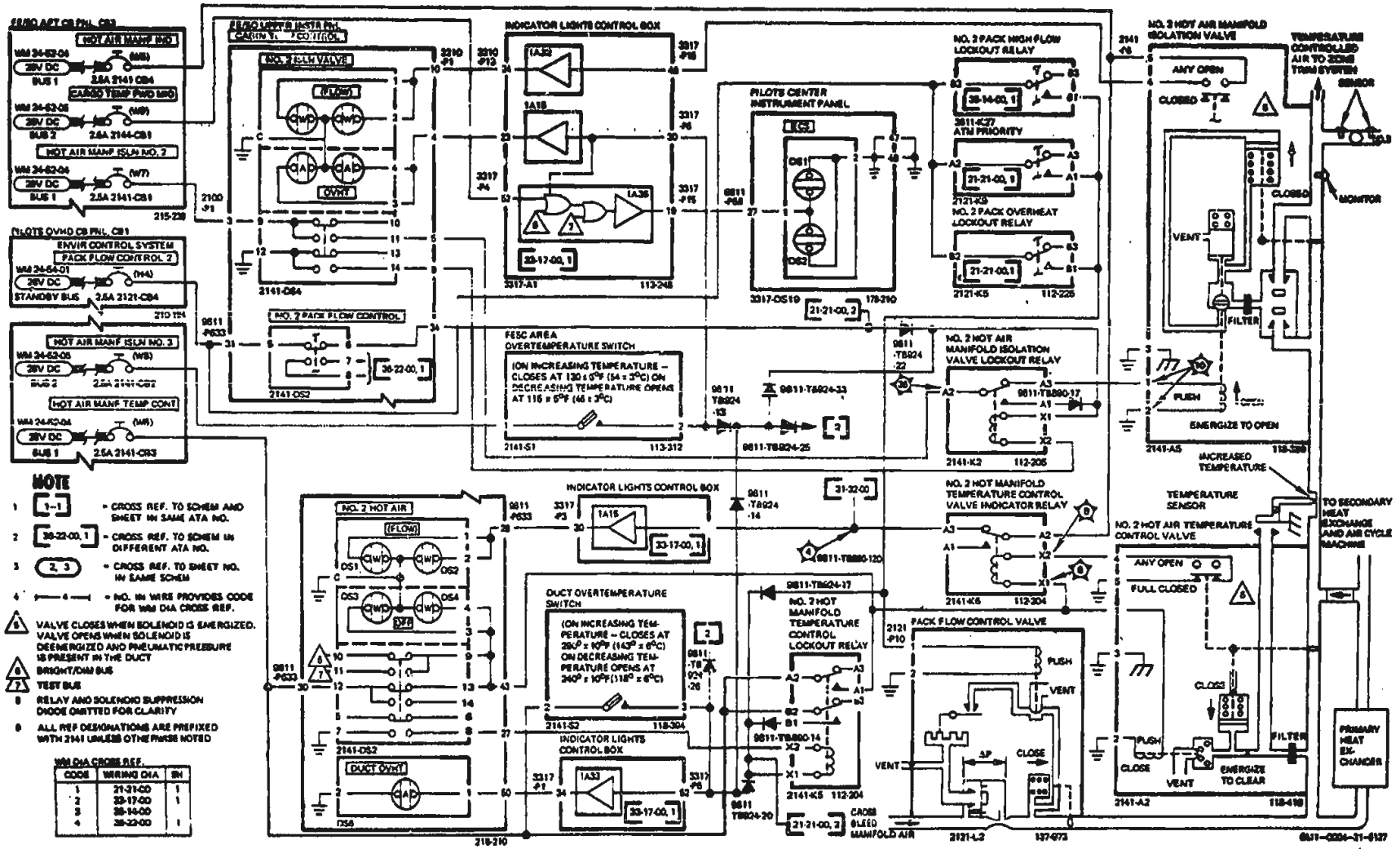
The hot air manifold temperature control valve is a flange-mounted, 3.5-inch-diameter, butterfly-type valve (Ref. Fig. 5). The inlet and outlet flanges are different to prevent improper installation. The valve is pneumatically actuated, with open or close selection made by an integrate solenoid-actuated vent valve. The valve pneumatic actuator is spring-loaded to the closed position. Valve opening is proportional to the pressure in the actuator opposing the spring action.

Pressure for the actuator is taken through a drilled passage and filter immediately upstream of the butterfly. A port in the top of the actuator connects the pressure to a variable


NOTE
1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [36-22-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4 ⟵4⟶ - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 VALVE CLOSES WHEN SOLENOID IS ENERGIZED. VALVE OPENS WHEN SOLENOID IS DEENERGIZED AND PNEUMATIC PRESSURE IS PRESENT IN THE DUCT
6 BRIGHT/DIM BUS
7 TEST BUS
8 RELAY AND SOLENOID SUPPRESSION DIODE OMITTED FOR CLARITY
9 ALL REF DESIGNATIONS ARE PREFIXED WITH 2141 UNLESS OTHERWISE NOTED
WM DIA CROSS REF.
CODE | WIRING DIA | SIZE
1 | 21-21-00 | 1
2 | 33-17-00 | 1
3 | 36-14-00 | 1
4 | 36-22-00 | 1
INDICATOR LIGHTS CONTROL BOX
NO. 2 PACK HIGH FLOW LOCKOUT RELAY
NO. 2 PACK OVERHEAT LOCKOUT RELAY
PILOTS CENTER INSTR PNL
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
TEMPERATURE CONTROLLED AIR TO ZONE TRIM SYSTEM
NO. 2 DUCT FLOW CONTROL VALVE
FESC AREA OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 130 ± 5°F (54 ± 3°C) ON DECREASING TEMPERATURE OPENS AT 115 ± 6°F (46 ± 3°C)
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 2 HOT AIR TEMPERATURE CONTROL VALVE
DUCT OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 280° ± 10°F (142° ± 6°C) ON DECREASING TEMPERATURE OPENS AT 240° ± 10° F (116° ± 6°C)
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
PACK FLOW CONTROL VALVE
INCREASED TEMPERATURE
TEMPERATURE SENSOR
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
PRIMARY HEAT EXCHANGER
CROSS BLEED MANIFOLD AIR

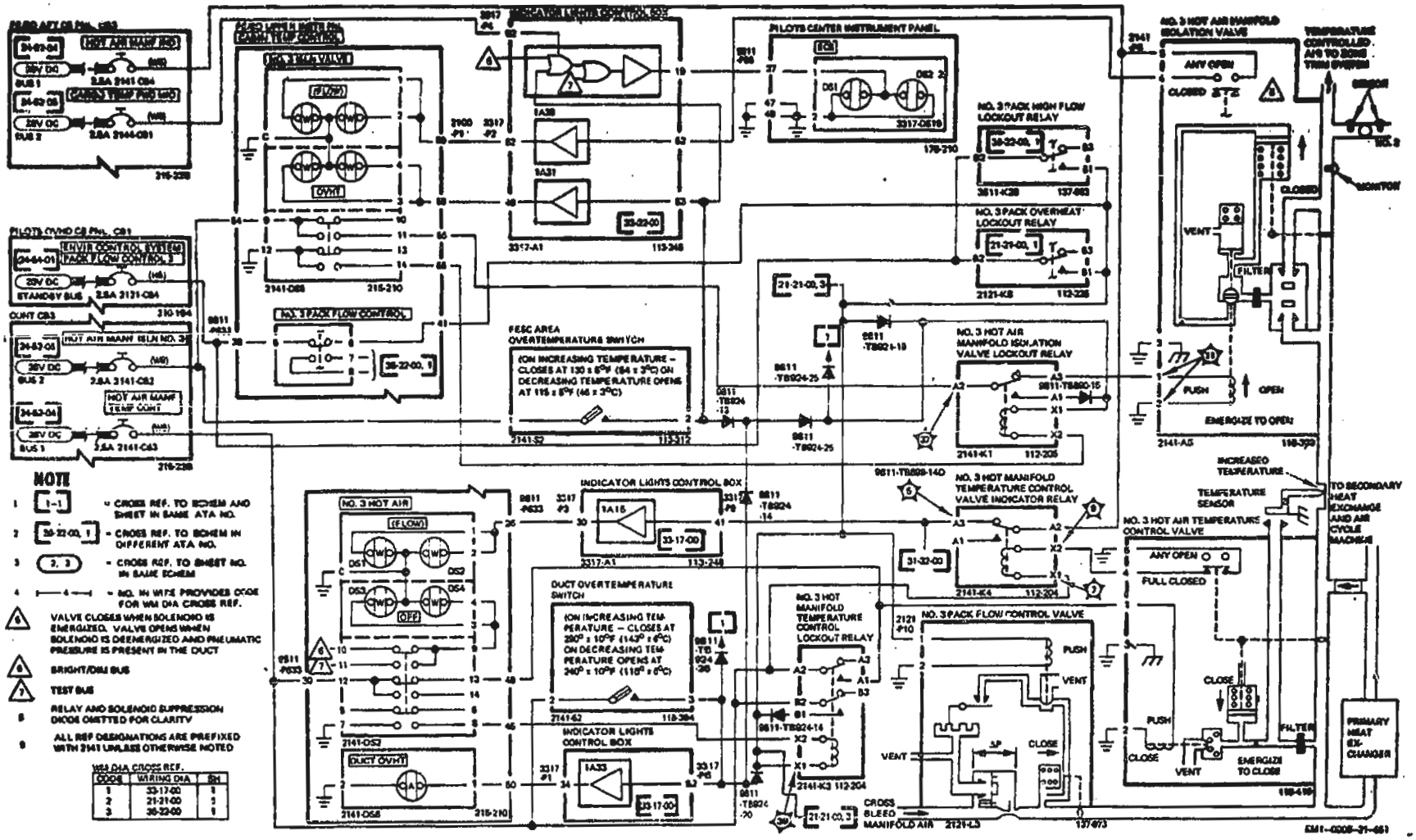
R No. 2 Hot Air Temperature and Isolation Valves Control Schematic
R Figure 3

EFFECTIVITY: WITHOUT SB21-140

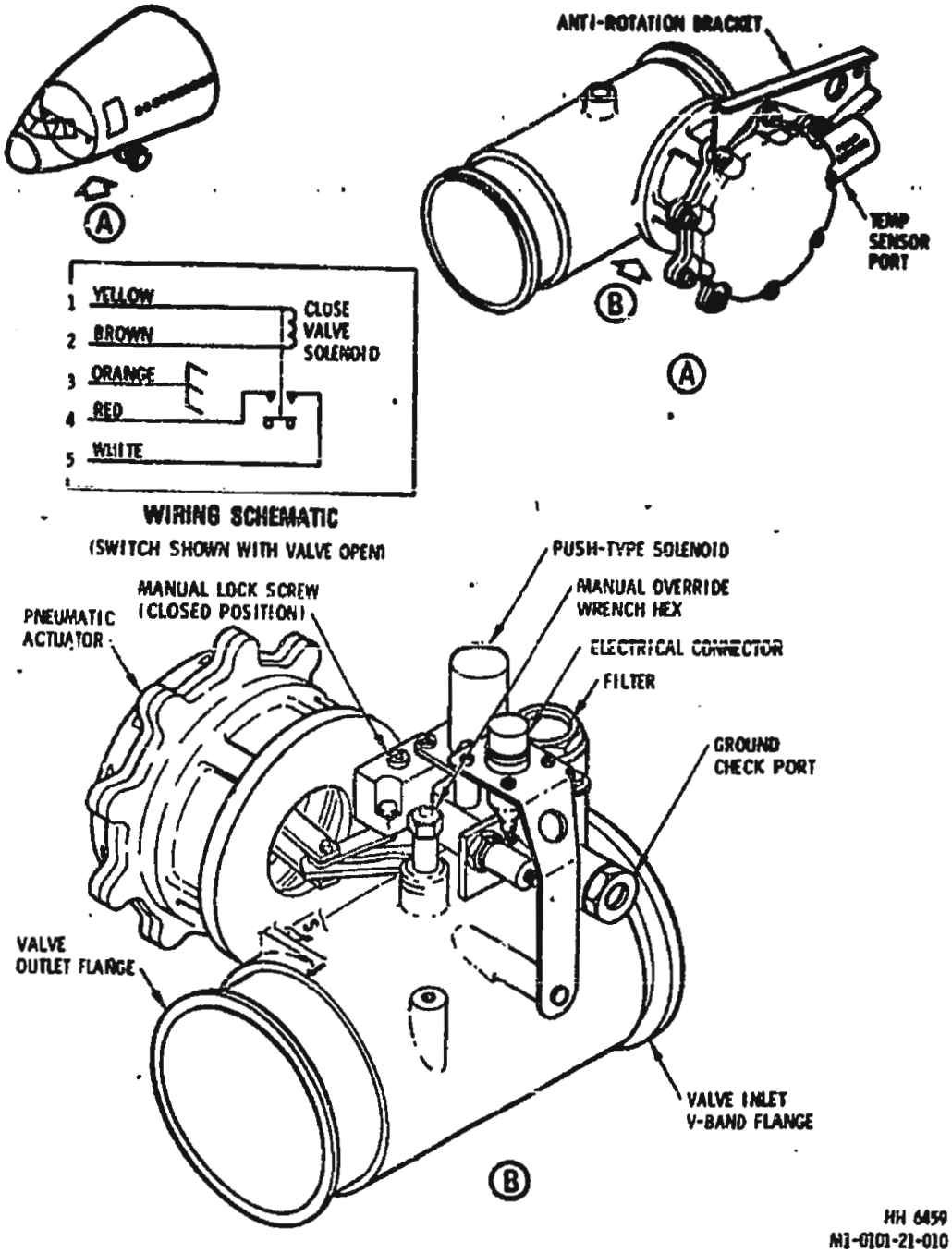

NOTE
1 1-1 = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 30-22-00, 1 = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 2, 3 = CROSS REF. TO SHEET NO. IN SAME SCHEM
4 = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
6 VALVE CLOSES WHEN SOLENOID IS ENERGIZED. VALVE OPENS WHEN SOLENOID IS DEENERGIZED AND PNEUMATIC PRESSURE IS PRESENT IN THE DUCT
7 BRIGHT/DIM BUS
8 TEST BUS
RELAY AND SOLENOID SUPPRESSION DIODE OMITTED FOR CLARITY
ALL REF DESIGNATIONS ARE PREFIXED WITH 2141 UNLESS OTHERWISE NOTED
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 21-21-00 | 1
2 | 33-17-00 | 1
3 | 36-14-00 | 1
4 | 36-22-00 | 1
HOT AIR MANF ISLN NO. 2
HOT AIR MANF ISLN NO. 3
HOT AIR MANF TEMP CONT
ENVIR CONTROL SYSTEM
PACK FLOW CONTROL 2
INDICATOR LIGHTS CONTROL BOX
PILOTS CENTER INSTRUMENT PANEL
NO. 2 PACK HIGH FLOW LOCKOUT RELAY
NO. 2 PACK OVERHEAT LOCKOUT RELAY
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
TEMPERATURE CONTROLLED AIR TO ZONE TRIM SYSTEM
FESC AREA OVERTEMPERATURE SWITCH
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 2 HOT AIR TEMPERATURE CONTROL VALVE
TEMPERATURE SENSOR
DUCT OVERTEMPERATURE SWITCH
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
PACK FLOW CONTROL VALVE
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
PRIMARY HEAT EXCHANGER
ENERGIZE TO OPEN
ENERGIZE TO CLEAR
INCREASED TEMPERATURE
CROSS BLEED MANIFOLD AIR

R No. 2 Hot Air Temperature and Isolation Valves Control Schematic
R Figure 3

EFFECTIVITY: WITH SB21-140


PILOTS CENTER INSTRUMENT PANEL
NO. 3 PACK HIGH FLOW LOCKOUT RELAY
NO. 3 PACK OVERHEAT LOCKOUT RELAY
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 3 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 3 HOT AIR TEMPERATURE CONTROL VALVE
NO. 3 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
NO. 3 PACK FLOW CONTROL VALVE
FESC AREA OVERTEMPERATURE SWITCH
DUCT OVERTEMPERATURE SWITCH
INDICATOR LIGHTS CONTROL BOX
TEMPERATURE SENSOR
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
PRIMARY HEAT EXCHANGER
CROSS BLEED MANIFOLD AIR
NOTE
VALVE CLOSES WHEN SOLENOID IS ENERGIZED. VALVE OPENS WHEN SOLENOID IS DEENERGIZED AND PNEUMATIC PRESSURE IS PRESENT IN THE DUCT
BRIGHT/DIM BUS
TEST BUS
RELAY AND SOLENOID SUPPRESSION DIODE OMITTED FOR CLARITY
ALL REF DESIGNATIONS ARE PREFIXED WITH 2141 UNLESS OTHERWISE NOTED
WIRING DIAGRAM CROSS REF.
CODE | WIRING DIAGRAM | SHEET
1 | 33-17-00 | 1
2 | 21-21-00 | 1
3 | 36-22-00 | 1

No. 3 Hot Air Temperature and Isolation Valves Control Schematic
Figure 4



Temperature Control Valve
Figure 5

orifice in the hot air manifold temperature control sensor. The pressure in the actuator and the resulting valve position are determined by the amount of pressure released by the control sensor (Ref. Fig. 6).

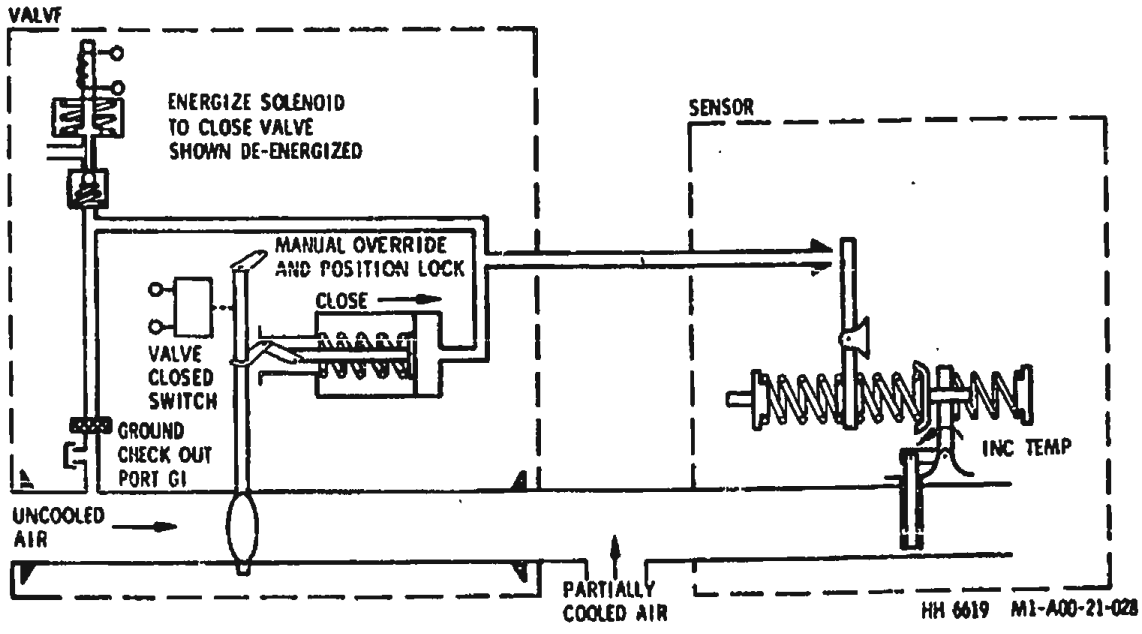
The integral solenoid-controlled vent on the valve is connected to the drilled pressure inlet passage. A ground check port is also connected to the pressure inlet passage. The ground check port permits use of an external pressure source to test valve operation.

A valve position indicator lever and a manual override wrench hex are located on the actuator end of the butterfly valve shaft. A valve position switch is actuated by the position indicator lever when the valve is in the fully closed position.

The wrench hex is used to manually override the actuator and position the valve. When the valve is closed manually, a screw is inserted through the linkage to lock the valve.

B. Operation

With the vent solenoid energized, the vent is open and the pressure in the actuator chamber is released, which closes the main valve. When the solenoid is deenergized, the vent



Temperature Control Valve and Sensor Schematic
Figure 6

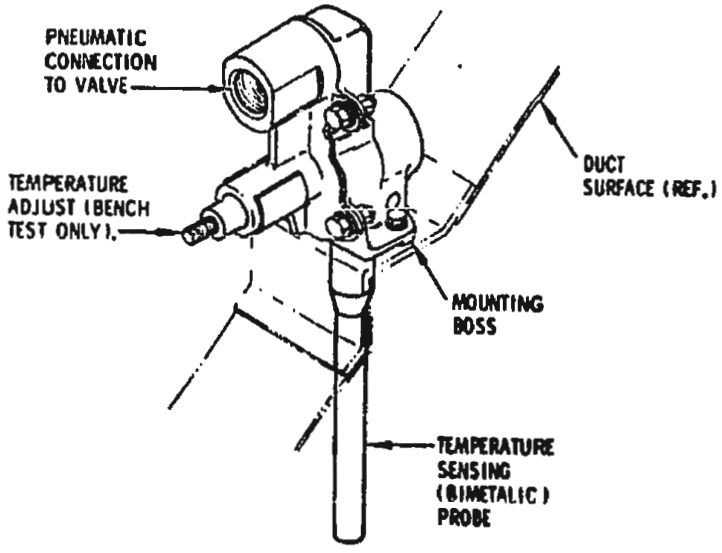
closes and directs pressure to the valve actuator and the temperature control sensor. With a sensed temperature below the desired value, the sensor bleed is closed and the pressure in the actuator fully opens the butterfly. As the sensor warms, the bleed opens and slowly and releases pressure from the actuator which causes the valve to start moving toward the closed position. The sensor modulates the actuator pressure to maintain the desired temperature.

4. Hot Air Manifold Temperature Control Sensor

A. Description

The hot air manifold temperature control sensor is a variable orifice bleed controlled by a bimetal sensing element (Ref. Fig. 7). The sensor contains the sensing element, a motion multiplying crank, adjustment springs, and the variable orifice. Adjustment is made only on a test bench and is not changed on the aircraft. The variable orifice is connected to the temperature control valve actuator by tubing.

B. Operation



Temperature Control Sensor
Figure 7

When the temperature of the bimetal element (Ref. Fig. 6) is below the desired point, the bimetal element (aluminum outer shell and invar rod) positions the motion multiplying crank and the pressure regulating springs to close the bleed orifice. As the sensed temperature rises, the aluminum shell expands more than the invar rod and the element length changes. The motion multiplier moves the pressure regulating springs to open the orifice. The bench adjustment calibration matches the orifice opening to the bleed requirements of the temperature control valve to maintain the desired temperature.

5. Hot Air Manifold Mixing Check Valve

A. Description and Operation

The hot air manifold mixing check valve is a 3.5-inch-diameter, four-sector, disc-type check valve. Each of the four valve flappers is hinged at the outer perimeter and lightly spring loaded to close. The valve seats form a 90-degree cross through the center of the valve. Four semihard bumpers around the inside of the valve housing provide open position stops. The bumpers are located to hold the valve flappers into the airstream enough to prevent flutter.

The mixing check valve permits flow of partially cooled air into the hot air manifold and prevents flow of uncooled air back to the dual heat exchanger. The check valve closes when its related air cycle pack is not in use, when the hot air manifold is not in use, or if a malfunction causes the hot air manifold temperature control valve to open excessively.

6. Hot Air Manifold Discharge Check Valve

A. Description and Operation

The hot air manifold discharge check valve is a 4-inch-diameter, four-sector, disc-type check valve. Each of the four valve flappers is hinged at the outer perimeter and lightly spring loaded to close. The valve seats form a 90-degree cross through the center of the valve. Four semihard bumpers around the inside of the valve housing provide open position stops. The bumpers are located to hold the valve flappers into the airstream enough to prevent flutter.

The hot air manifold discharge check valve prevents reverse flow from the zone trim system to the hot air manifold when

the manifold is not in use, and prevents loss of cabin air pressure in the event any duct or component in the air cycle pack ruptures.

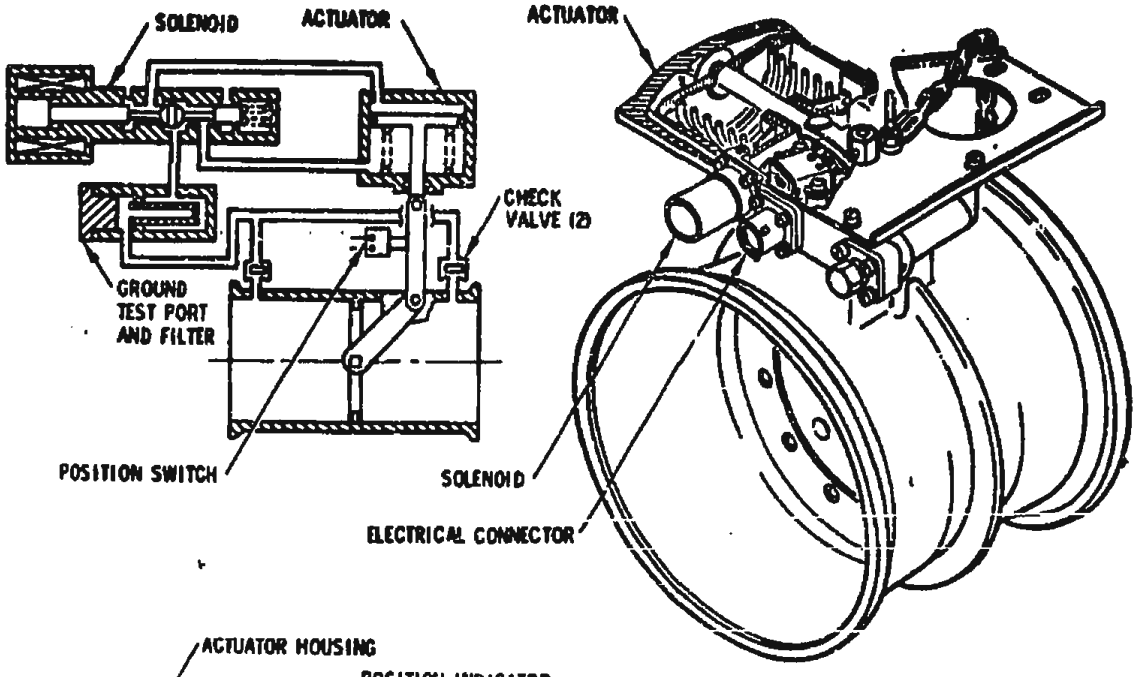
7. Hot Air Manifold Isolation Valve

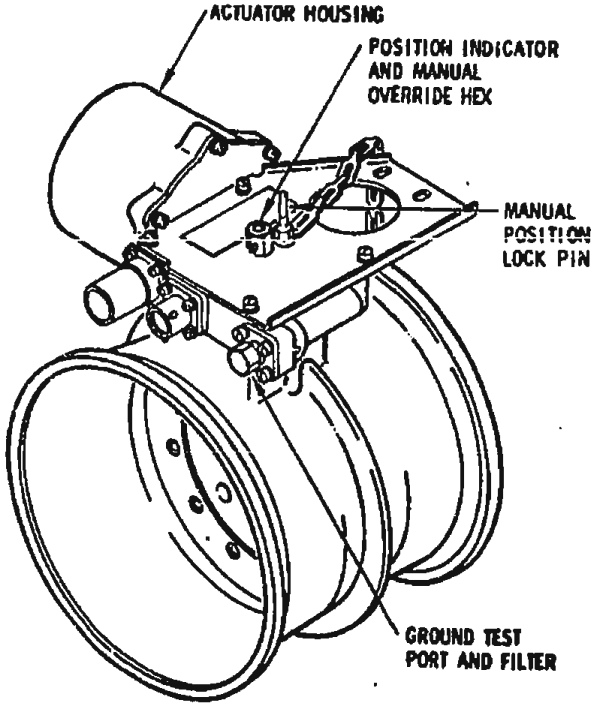
A. Description and Operation

The hot air manifold isolation valve is a flange-and-bracket-mounted, 4-inch-diameter butterfly valve (Ref. Fig. 8). The valve is electrically controlled and pneumatically powered. Drilled ports in the valve bore on each side of the butterfly admit pneumatic pressure through two small check valves to a common passage. This passage leads through a filter to a solenoid-controlled valve which either blocks the pressure or admits it to the valve actuator chamber. The actuator piston is spring loaded to keep the valve in the closed position when pressure is not available.

A position indicator on the actuator end of the butterfly shaft provides visual indication of the butterfly position and manual override capability. A wrench is used on the hexagonal indicator to open or close the valve manually. A locking pin, carried on the valve housing, is used to lock the valve in the desired position.

When no pneumatic pressure is available, the butterfly is held closed by the spring-loaded actuator. With pressure available, the valve is positively held closed as long as the solenoid is deenergized. When the solenoid is energized, the solenoid valve transfers the pneumatic pressure to the open side of the actuator and vents the close side. The pneumatic pressure overcomes the spring pressure and opens the valve.

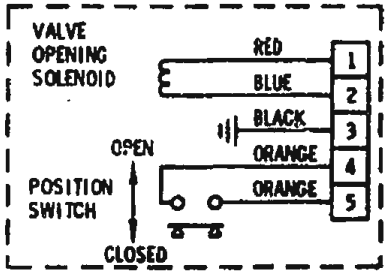




NOTE

TO MANUALLY POSITION AND LOCK VALVE

1. USE WRENCH ON MANUAL OVERRIDE HEX TO OPEN OR SHUT VALVE AS REQUIRED
2. REMOVE LOCK PIN AND RE-INSTALL IN REVERSE DIRECTION (LONG END INTO VALVE)
3. RELEASE WRENCH, CHECK THAT VALVE POSITION REMAINS AS SELECTED



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M1-0101-21-014

Hot Air Manifold Isolation Valve
Figure 8

R # HOT AIR MANIFOLD SYSTEM - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting Hot Air Manifold system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Hot Air Manifold system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
103	Duct OVHT Light On, Both HOT AIR and ISLN VALVE Flowbars Off
104	HOT AIR Flowbar Off, Switchlight Depressed, OFF Light Off
105	HOT AIR Switchlight Released, Flowbar On, OFF Light On
106	HOT AIR OFF Light Problems
107	Hot Air ISLN VALVE OVHT Light On
108	Hot Air ISLN VALVE Flowbar OFF, Switchlight Depressed, OVHT Off
109	Hot Air ISLN VALVE Switchlight Released, Flowbar On
110	Hot Air Temperature Problems
SCHEM 1	Hot Air Temperature Control Schematic
SCHEM 2	Hot Air Isolation Valves Control Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
BOX – INDICATOR LIGHTS CONTROL:			
ILCB CARD 1A15	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A28	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A31	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A32	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
ILCB CARD 1A33	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
CIRCUIT BREAKERS:			
CARGO TEMP – FWD MID (2144-CB1)	1	FLT STA/CB3 (W9)	•
ENVIR CONTROL SYSTEM – PACK FLOW CONTROL 2 (2121-CB3)	1	FLT STA/CB1 (H4)	•
ENVIR CONTROL SYSTEM – PACK FLOW CONTROL 3 (2121-CB4)	1	FLT STA/CB1 (H5)	•
HOT AIR MANF – IND (2141-CB4)	1	FLT STA/CB3 (W5)	•
HOT AIR MANF – ISLN NO. 2 (2141-CB1)	1	FLT STA/CB3 (W7)	•
HOT AIR MANF – ISLN NO. 3 (2141-CB2)	1	FLT STA/CB3 (W8)	•
HOT AIR MANF – TEMP CONT (2141-CB3)	1	FLT STA/CB3 (W6)	•
INDICATOR LIGHT – DUCT OVHT	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	33-17-01
INDICATOR LIGHT – ECS	1	FLT STA, PILOT'S CENTER INSTRUMENT PANEL/P2	33-17-99
RELAYS:			
ATM PRIORITY CONTROL (2121-K9)	1	MESC, AFT LH RELAY PANEL/ 192ER-1	•
NO. 2 HIGH FLOW LOCKOUT (3611-K27)	1	MESC, AFT RH RELAY PANEL/ 252GR-1	•
NO. 3 HIGH FLOW LOCKOUT (3611-K28)	1	MESC, AFT RH RELAY PANEL/ 252GR-1	•
NO. 2 HOT MANF TEMP CONT LOCKOUT (2141-K5)	1	FESC, BELOW FWD ELECT RACK/112AB	•
NO. 3 HOT MANF TEMP CONT LOCKOUT (2141-K3)	1	FESC, BELOW FWD ELECT RACK/112AB	•
NO. 2 HOT MANF TEMP CONT VALVE IND (2141-K6)	1	FESC, BELOW FWD ELECT RACK/112AB	•
NO. 3 HOT MANF TEMP CONT VALVE IND (2141-K4)	1	FESC, BELOW FWD ELECT RACK/112AB	•
NO. 2 PACK OVHT LOCKOUT (2121-K5)	1	FESC, BELOW FWD ELECT RACK/112AB	•

*SEE WM EQUIPMENT LIST

M1-0000-21-1198

R Component Location Index
R Figure 101 (Sheet 1)

EFFECTIVITY: ALL

COMPONENT	QTY	AREA/ACCESS	REFERENCE
RELAYS (CONT.):			
NO. 3 PACK OVHT LOCKOUT (2121-K8)	1	FESC, BELOW FWD ELECT RACK/112AB	*
NO. 2 HOT MANF ISLN VALVE LOCKOUT (2141-K2)	1	FESC, BELOW FWD ELECT RACK/112AB	*
NO. 3 HOT MANF ISLN VALVE LOCKOUT (2141-K1)	1	FESC, BELOW FWD ELECT RACK/112AB	*
SENSOR – HOT AIR MANIFOLD TEMPERATURE CONTROL	2	RH ECS COMPT FWD/118CR	21-41-05
SWITCH – DUCT OVERTEMPERATURE (2141-S2)	1	FESC, AFT CENTER/112AB	21-41-19
SWITCH – FORWARD ELECTRONIC SERVICE CENTER AREA OVERTEMPERATURE (2141-S1)	1	FESC, AFT RH/112AB	21-41-20
SWITCHLIGHTS:			
NO. 2 ISLN VALVE (2141-DS4)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
NO. 3 ISLN VALVE (2141-DS5)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
NO. 2 HOT AIR (2141-DS1)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
NO. 3 HOT AIR (2141-DS2)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
NO. 2 PACK FLOW CONTROL (2121-DS2)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
NO. 3 PACK FLOW CONTROL (2121-DS3)	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01
VALVE – NO. 2 PACK FLOW CONTROL	1	UNDER MESC/137GL	21-21-01
VALVE – NO. 3 PACK FLOW CONTROL	1	UNDER MESC/137FR	21-21-01
VALVE – HOT AIR MANIFOLD TEMPERATURE CONTROL	2	RH ECS COMPT/118CR	21-41-02
VALVE – HOT AIR MANIFOLD ISOLATION	2	RH ECS COMPT/110CR	21-41-17

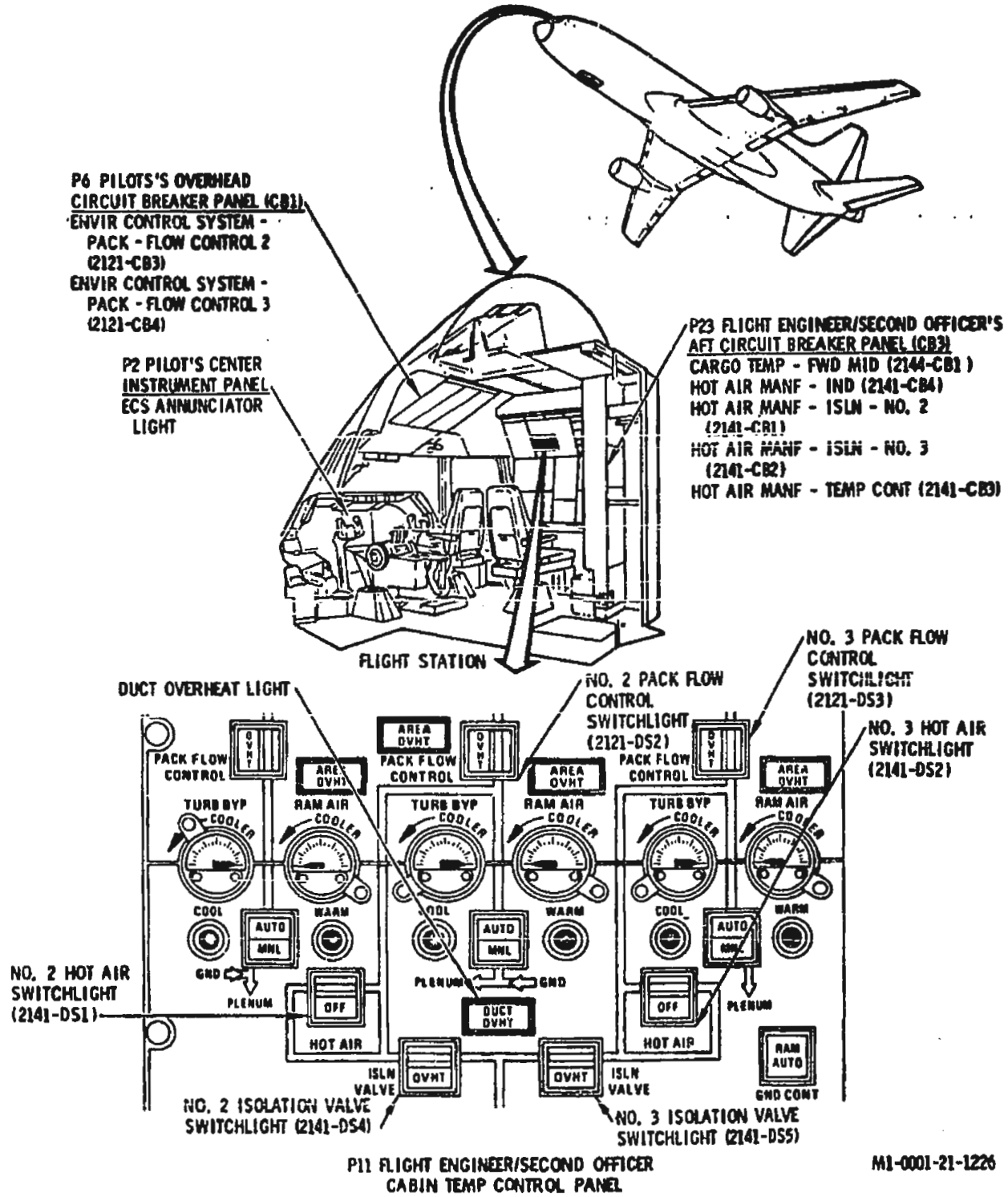
*SEE WM EQUIPMENT LIST

M1-0002-21-1228

R Component Location Index
R Figure 101 (Sheet 2)

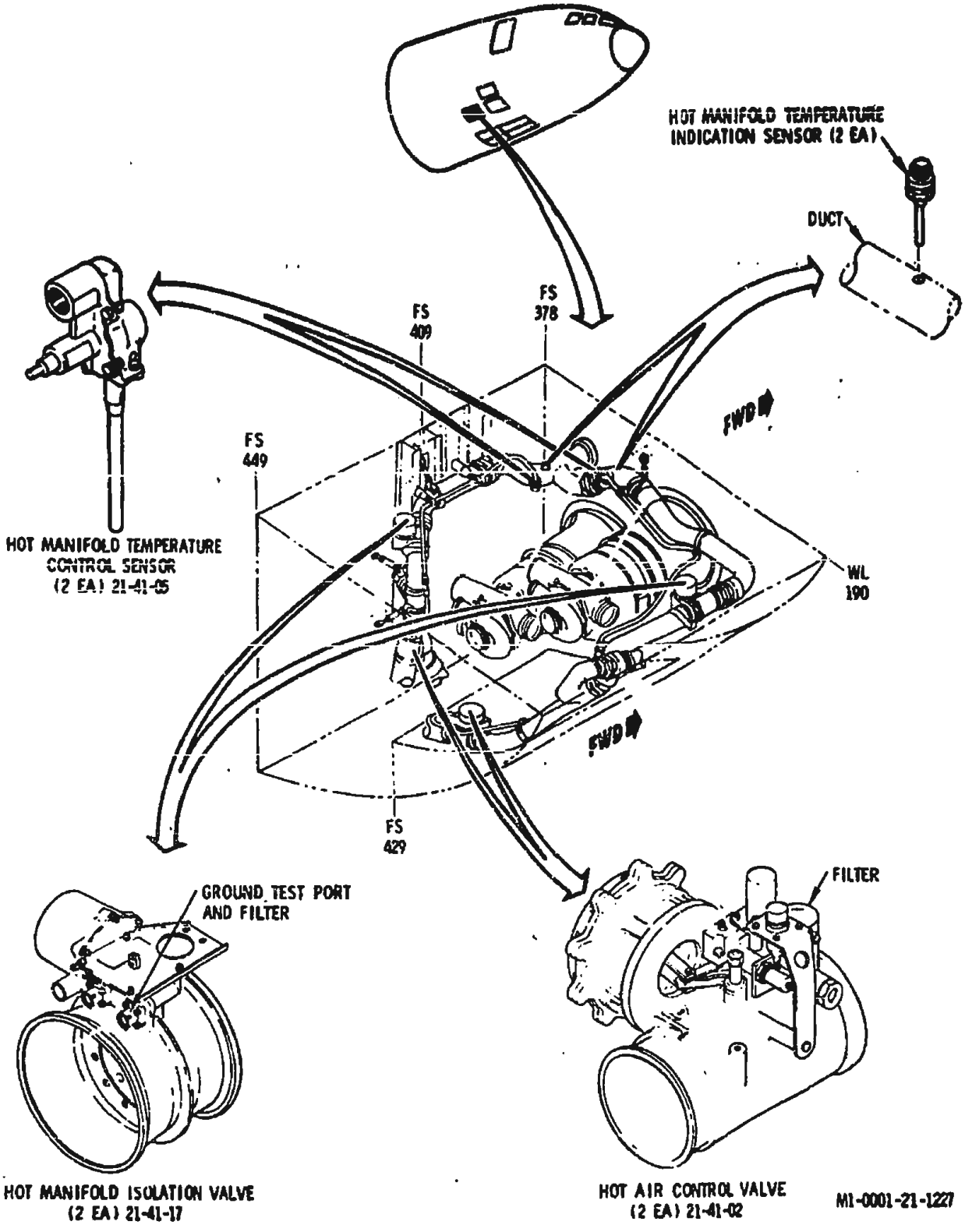
EFFECTIVITY: ALL

001B

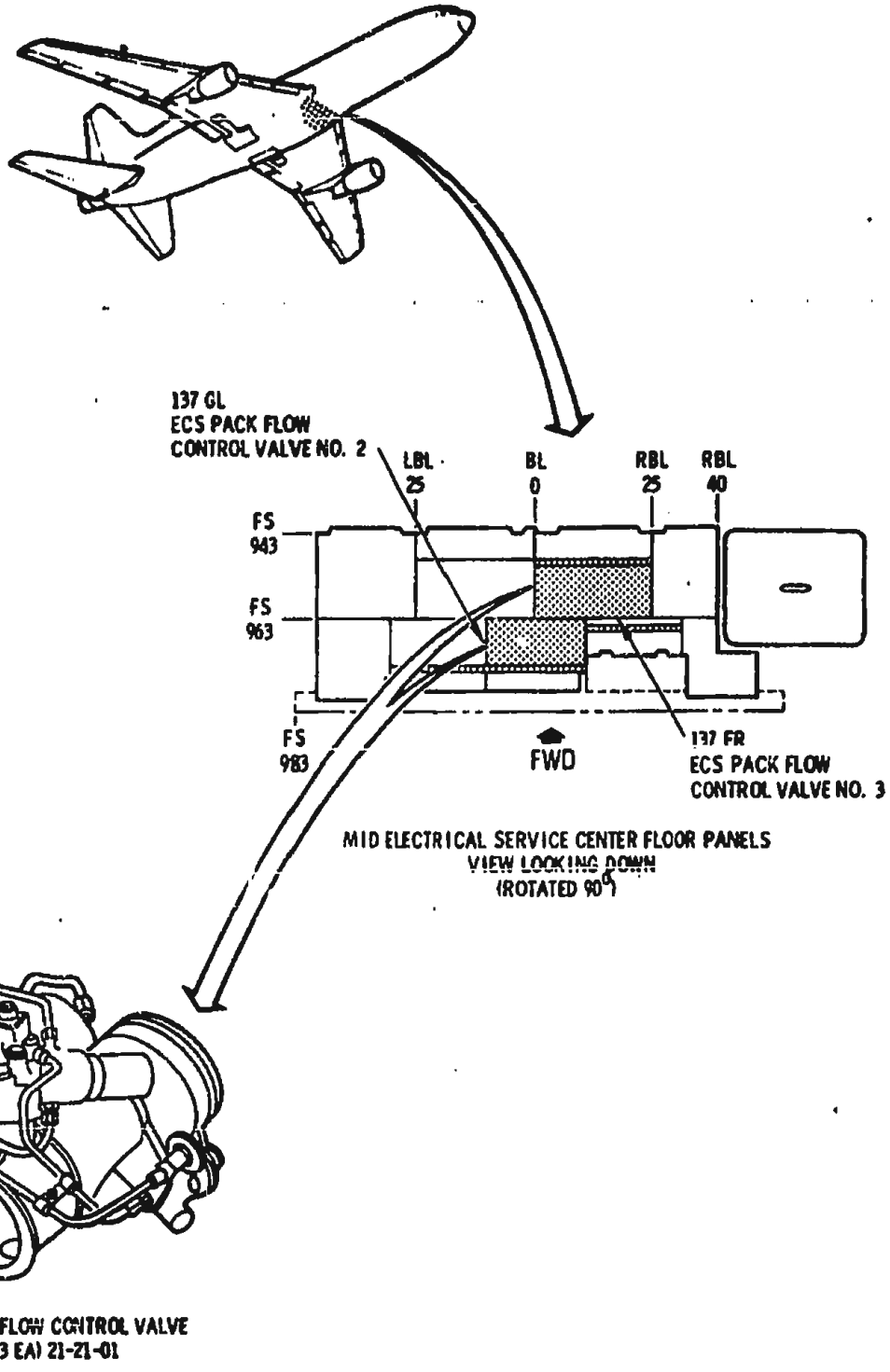


R Component Locator Diagram
R Figure 102 (Sheet 1)

EFFECTIVITY: ALL

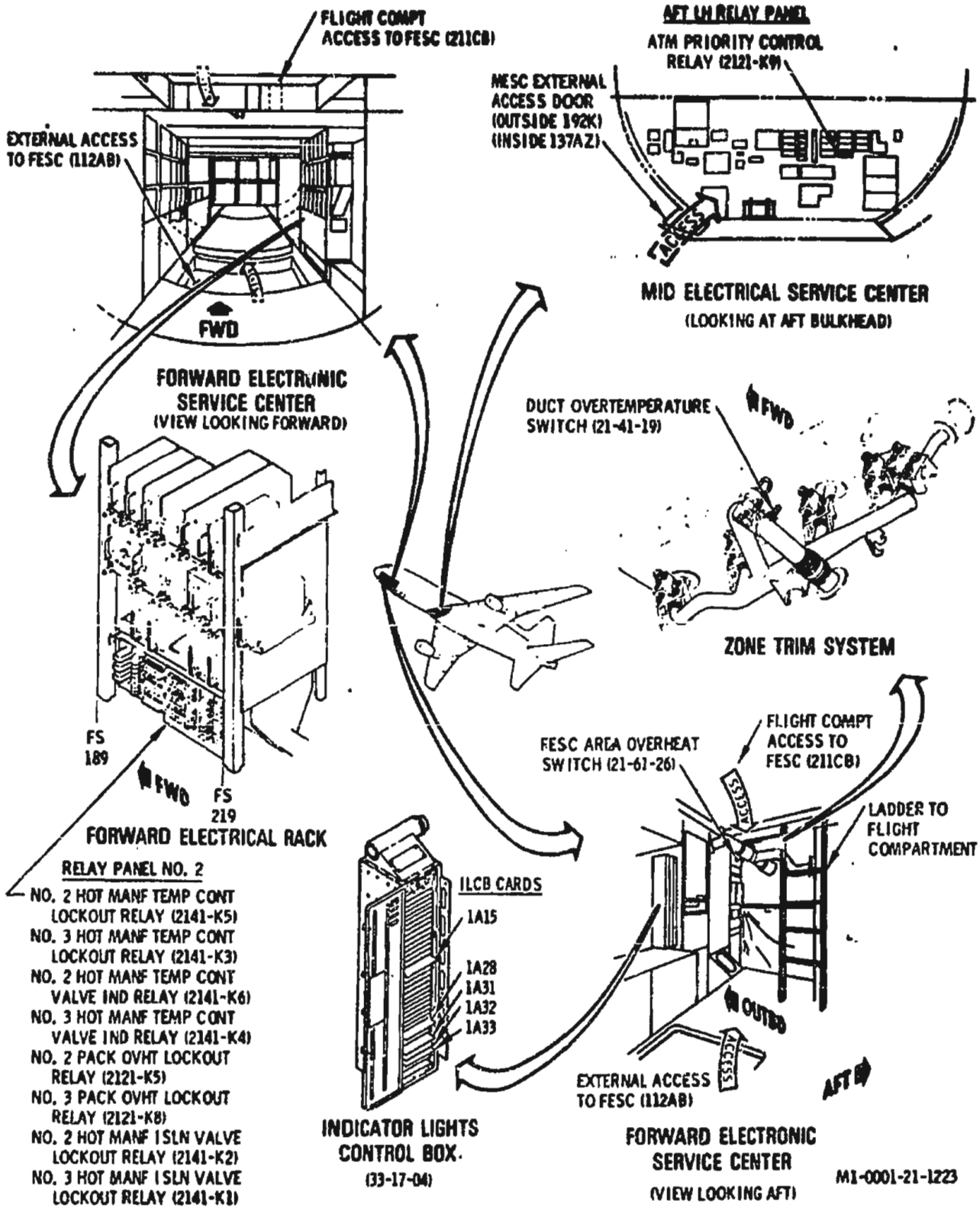


Component Locator Diagram
Figure 102 (Sheet 2)

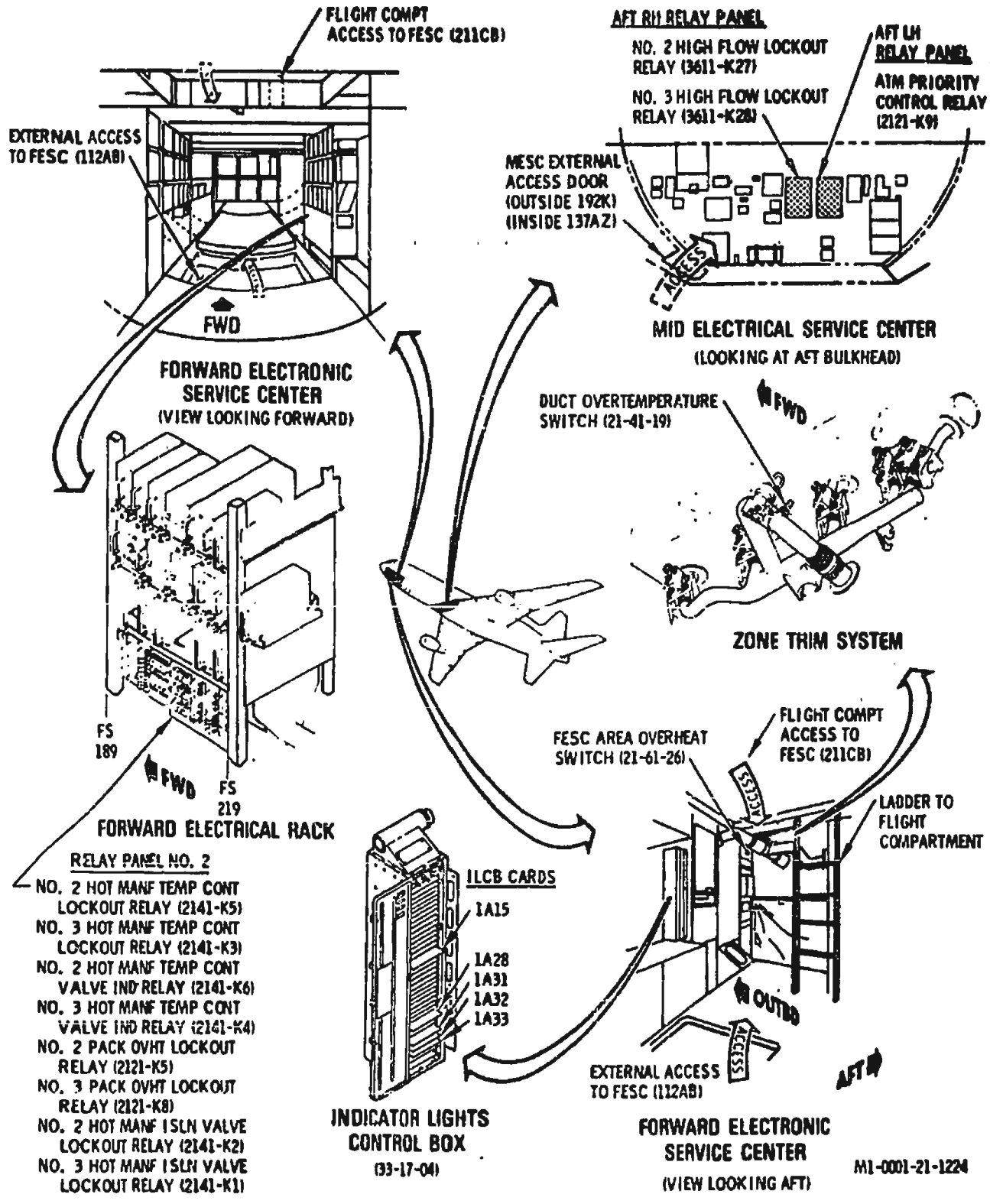


M1-0001-21-1575

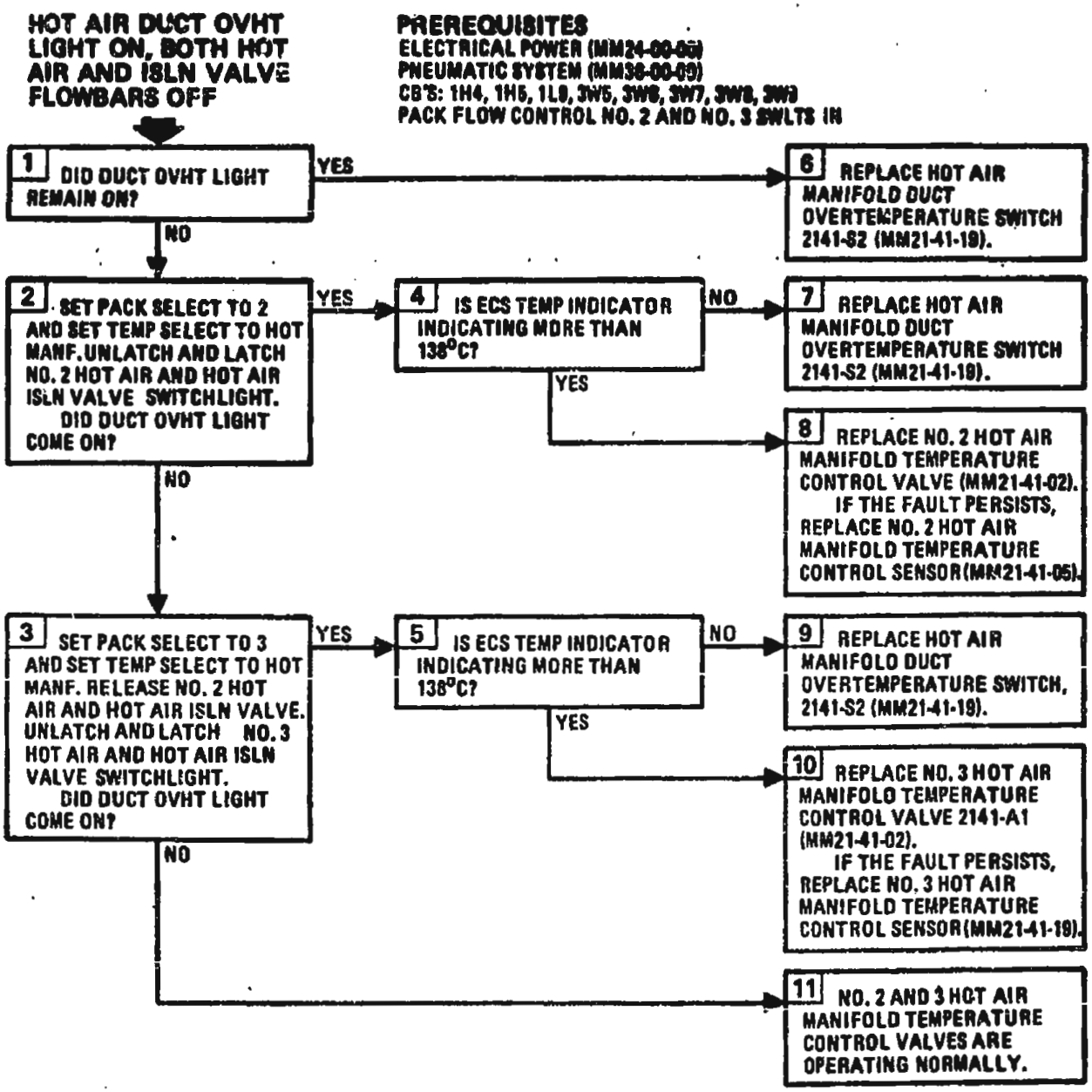
Component Locator Diagram
Figure 102 (Sheet 3)



Component Locator Diagram
Figure 102 (Sheet 4)

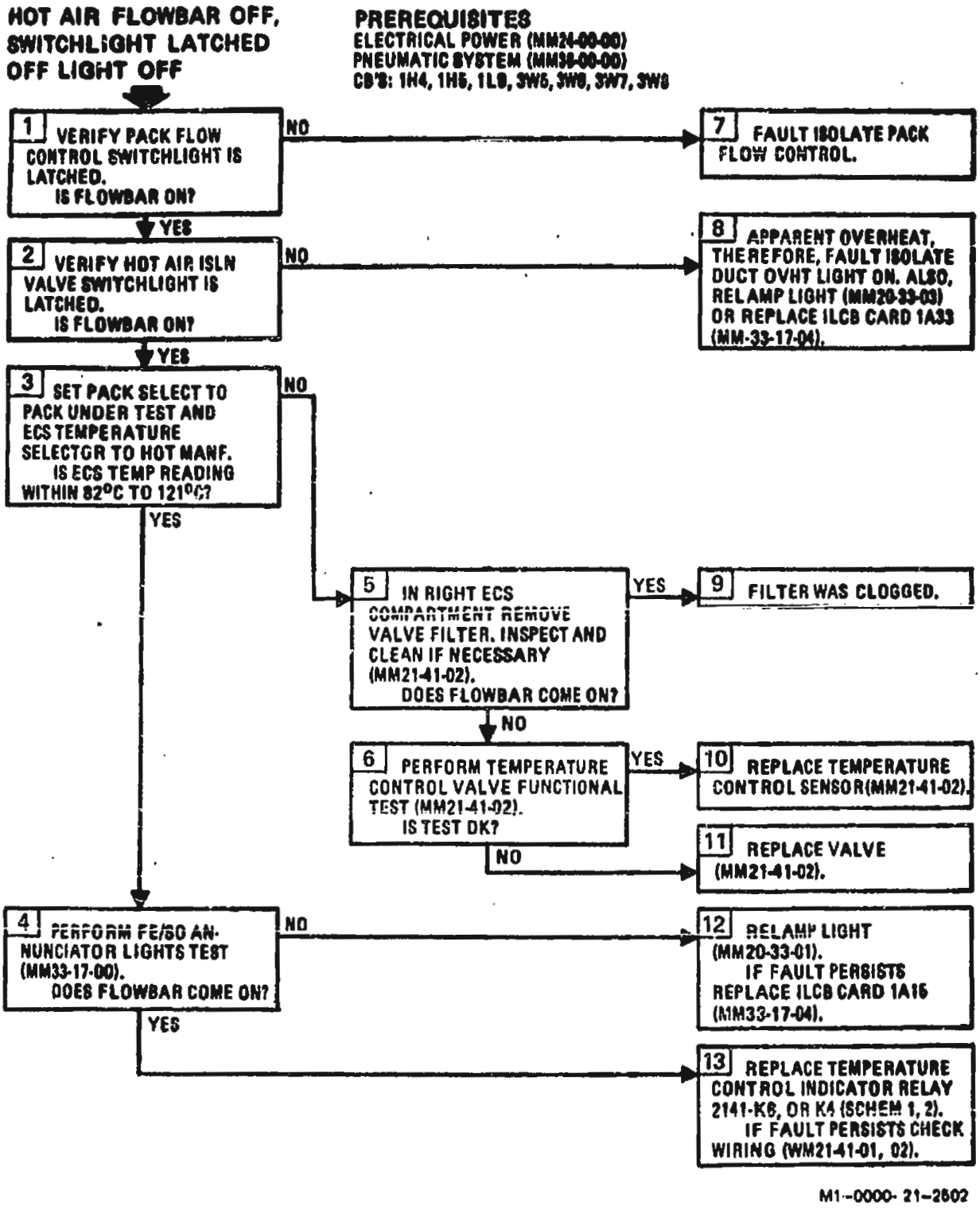

FLIGHT COMPT ACCESS TO FESC (211CB)
EXTERNAL ACCESS TO FESC (112AB)
FWD
FORWARD ELECTRONIC SERVICE CENTER
(VIEW LOOKING FORWARD)
AFT RH RELAY PANEL
NO. 2 HIGH FLOW LOCKOUT RELAY (3611-K27)
NO. 3 HIGH FLOW LOCKOUT RELAY (3611-K28)
AFT LH RELAY PANEL
ATM PRIORITY CONTROL RELAY (2121-K9)
MESC EXTERNAL ACCESS DOOR (OUTSIDE 192K) (INSIDE 137AZ)
ACCESS
MID ELECTRICAL SERVICE CENTER
(LOOKING AT AFT BULKHEAD)
DUCT OVERTEMPERATURE SWITCH (21-41-19)
FWD
ZONE TRIM SYSTEM
FS 189
FWD
FS 219
FORWARD ELECTRICAL RACK
RELAY PANEL NO. 2
NO. 2 HOT MANF TEMP CONT LOCKOUT RELAY (2141-K5)
NO. 3 HOT MANF TEMP CONT LOCKOUT RELAY (2141-K3)
NO. 2 HOT MANF TEMP CONT VALVE IND RELAY (2141-K6)
NO. 3 HOT MANF TEMP CONT VALVE IND RELAY (2141-K4)
NO. 2 PACK OVHT LOCKOUT RELAY (2121-K5)
NO. 3 PACK OVHT LOCKOUT RELAY (2121-K8)
NO. 2 HOT MANF ISLN VALVE LOCKOUT RELAY (2141-K2)
NO. 3 HOT MANF ISLN VALVE LOCKOUT RELAY (2141-K1)
ILCB CARDS
1A15
1A28
1A31
1A32
1A33
INDICATOR LIGHTS CONTROL BOX
(33-17-04)
FESC AREA OVERHEAT SWITCH (21-61-26)
FLIGHT COMPT ACCESS TO FESC (211CB)
ACCESS
LADDER TO FLIGHT COMPARTMENT
OUTBD
ACCESS
EXTERNAL ACCESS TO FESC (112AB)
AFT
FORWARD ELECTRONIC SERVICE CENTER
(VIEW LOOKING AFT)
M1-0001-21-1224

Component Locator Diagram
Figure 102 (Sheet 4)

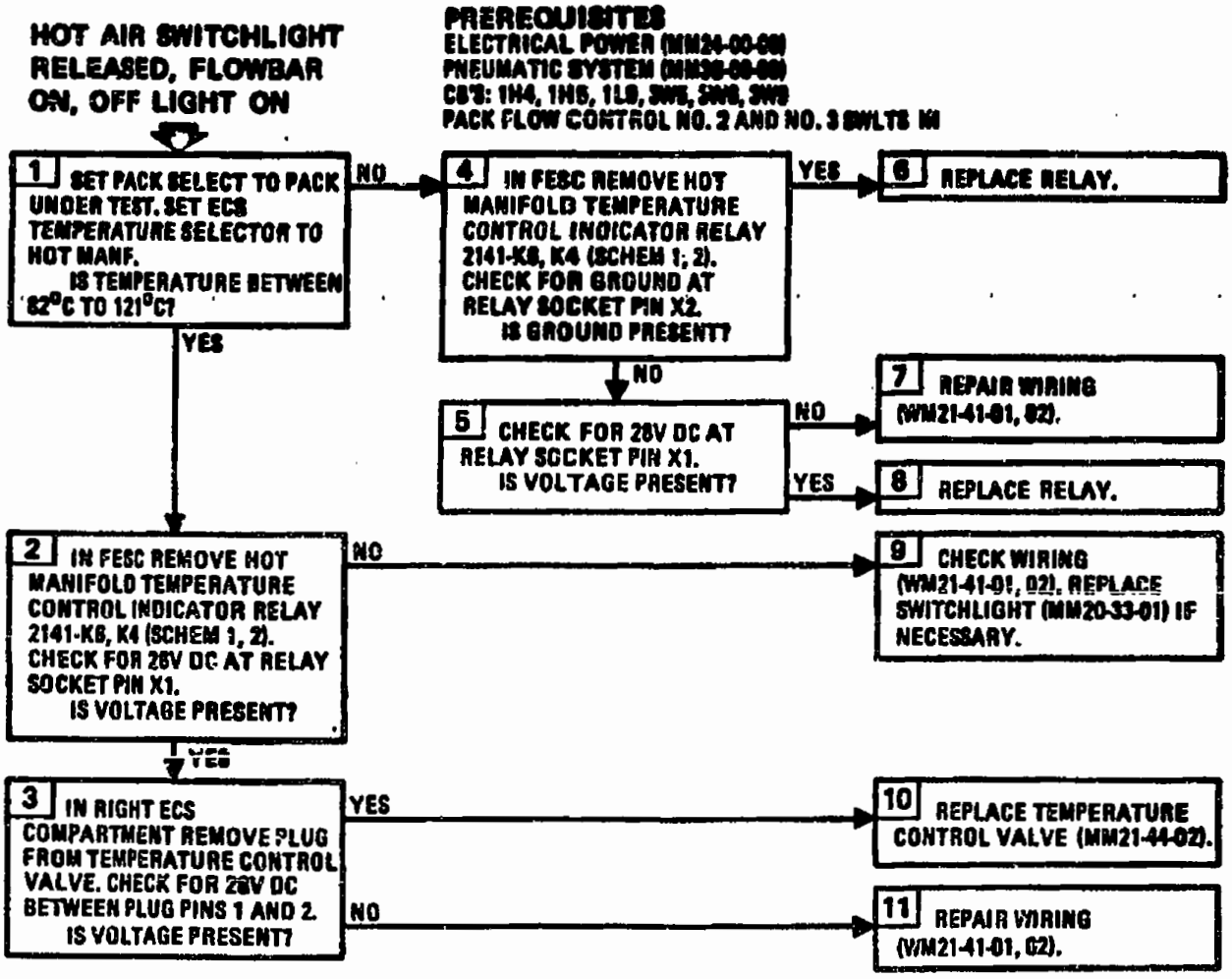

HOT AIR DUCT OVHT LIGHT ON, BOTH HOT AIR AND ISLN VALVE FLOWBARS OFF
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CB'S: 1H4, 1H5, 1L8, 3W5, 3W6, 3W7, 3W8, 3W9
PACK FLOW CONTROL NO. 2 AND NO. 3 SWLTS IN
1 DID DUCT OVHT LIGHT REMAIN ON?
YES
NO
6 REPLACE HOT AIR MANIFOLD DUCT OVERTEMPERATURE SWITCH 2141-S2 (MM21-41-19).
2 SET PACK SELECT TO 2 AND SET TEMP SELECT TO HOT MANF. UNLATCH AND LATCH NO. 2 HOT AIR AND HOT AIR ISLN VALVE SWITCHLIGHT. DID DUCT OVHT LIGHT COME ON?
YES
4 IS ECS TEMP INDICATOR INDICATING MORE THAN 138°C?
NO
7 REPLACE HOT AIR MANIFOLD DUCT OVERTEMPERATURE SWITCH 2141-S2 (MM21-41-19).
YES
8 REPLACE NO. 2 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE (MM21-41-02). IF THE FAULT PERSISTS, REPLACE NO. 2 HOT AIR MANIFOLD TEMPERATURE CONTROL SENSOR (MM21-41-05).
NO
3 SET PACK SELECT TO 3 AND SET TEMP SELECT TO HOT MANF. RELEASE NO. 2 HOT AIR AND HOT AIR ISLN VALVE. UNLATCH AND LATCH NO. 3 HOT AIR AND HOT AIR ISLN VALVE SWITCHLIGHT. DID DUCT OVHT LIGHT COME ON?
YES
5 IS ECS TEMP INDICATOR INDICATING MORE THAN 138°C?
NO
9 REPLACE HOT AIR MANIFOLD DUCT OVERTEMPERATURE SWITCH, 2141-S2 (MM21-41-19).
YES
10 REPLACE NO. 3 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE 2141-A1 (MM21-41-02). IF THE FAULT PERSISTS, REPLACE NO. 3 HOT AIR MANIFOLD TEMPERATURE CONTROL SENSOR (MM21-41-19).
NO
11 NO. 2 AND 3 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVES ARE OPERATING NORMALLY.

M1-0008-21-8010

Hot Air DUCT OVHT Annunciator Legend On, Both HOT AIR and ISLN VALVE Flowbars Off
Figure 103

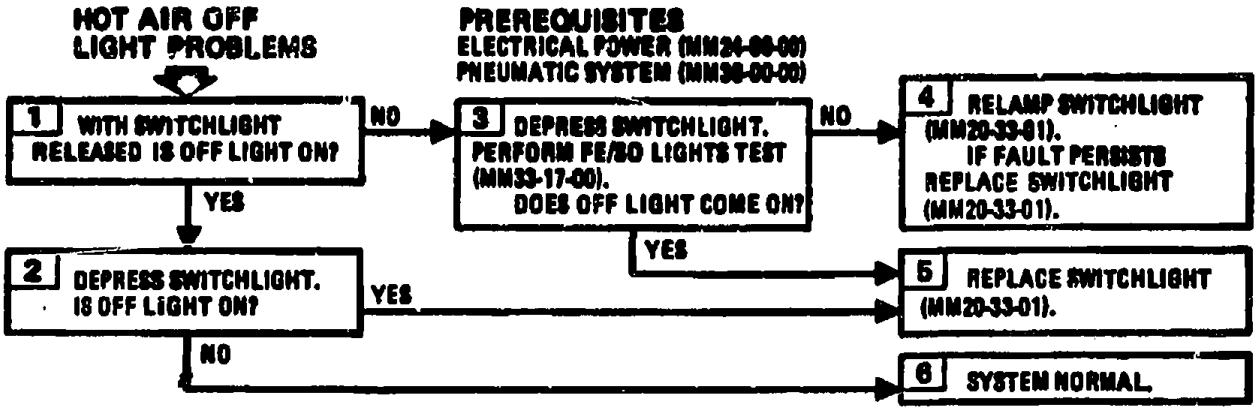

HOT AIR FLOWBAR OFF, SWITCHLIGHT LATCHED OFF LIGHT OFF
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CB'S: 1H4, 1H5, 1L8, 3W5, 3W6, 3W7, 3W8
1 VERIFY PACK FLOW CONTROL SWITCHLIGHT IS LATCHED. IS FLOWBAR ON?
NO
7 FAULT ISOLATE PACK FLOW CONTROL.
YES
2 VERIFY HOT AIR ISLN VALVE SWITCHLIGHT IS LATCHED. IS FLOWBAR ON?
NO
8 APPARENT OVERHEAT, THEREFORE, FAULT ISOLATE DUCT OVHT LIGHT ON. ALSO, RELAMP LIGHT (MM20-33-03) OR REPLACE ILCB CARD 1A33 (MM-33-17-04).
YES
3 SET PACK SELECT TO PACK UNDER TEST AND ECS TEMPERATURE SELECTOR TO HOT MANF. IS ECS TEMP READING WITHIN 82°C TO 121°C?
NO
YES
5 IN RIGHT ECS COMPARTMENT REMOVE VALVE FILTER. INSPECT AND CLEAN IF NECESSARY (MM21-41-02). DOES FLOWBAR COME ON?
YES
9 FILTER WAS CLOGGED.
NO
6 PERFORM TEMPERATURE CONTROL VALVE FUNCTIONAL TEST (MM21-41-02). IS TEST OK?
YES
10 REPLACE TEMPERATURE CONTROL SENSOR(MM21-41-02).
NO
11 REPLACE VALVE (MM21-41-02).
4 PERFORM FE/60 ANNUNCIATOR LIGHTS TEST (MM33-17-00). DOES FLOWBAR COME ON?
NO
12 RELAMP LIGHT (MM20-33-01). IF FAULT PERSISTS REPLACE ILCB CARD 1A15 (MM33-17-04).
YES
13 REPLACE TEMPERATURE CONTROL INDICATOR RELAY 2141-K6, OR K4 (SCHEM 1, 2). IF FAULT PERSISTS CHECK WIRING (WM21-41-01, 02).
M1-0000-21-2602

HOT AIR Flowbar Off, Switchlight Latched, OFF Legend Off
Figure 104


HOT AIR SWITCHLIGHT RELEASED, FLOWBAR ON, OFF LIGHT ON
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CB'S: 1H4, 1H5, 1L8, 3W6, 3W8, 3W9
PACK FLOW CONTROL NO. 2 AND NO. 3 SWLTS M
1 SET PACK SELECT TO PACK UNDER TEST. SET ECS TEMPERATURE SELECTOR TO HOT MANF.
IS TEMPERATURE BETWEEN 82°C TO 121°C?
NO
YES
4 IN FESC REMOVE HOT MANIFOLD TEMPERATURE CONTROL INDICATOR RELAY 2141-K8, K4 (SCHEM 1; 2). CHECK FOR GROUND AT RELAY SOCKET PIN X2.
IS GROUND PRESENT?
YES
6 REPLACE RELAY.
NO
5 CHECK FOR 28V DC AT RELAY SOCKET PIN X1.
IS VOLTAGE PRESENT?
NO
7 REPAIR WIRING (WM21-41-01, 02).
YES
8 REPLACE RELAY.
2 IN FESC REMOVE HOT MANIFOLD TEMPERATURE CONTROL INDICATOR RELAY 2141-K8, K4 (SCHEM 1, 2). CHECK FOR 28V DC AT RELAY SOCKET PIN X1.
IS VOLTAGE PRESENT?
NO
9 CHECK WIRING (WM21-41-01, 02). REPLACE SWITCHLIGHT (MM20-33-01) IF NECESSARY.
YES
3 IN RIGHT ECS COMPARTMENT REMOVE PLUG FROM TEMPERATURE CONTROL VALVE. CHECK FOR 28V DC BETWEEN PLUG PINS 1 AND 2.
IS VOLTAGE PRESENT?
YES
10 REPLACE TEMPERATURE CONTROL VALVE (MM21-44-02).
NO
11 REPAIR WIRING (WM21-41-01, 02).

M1-0003-21-8008

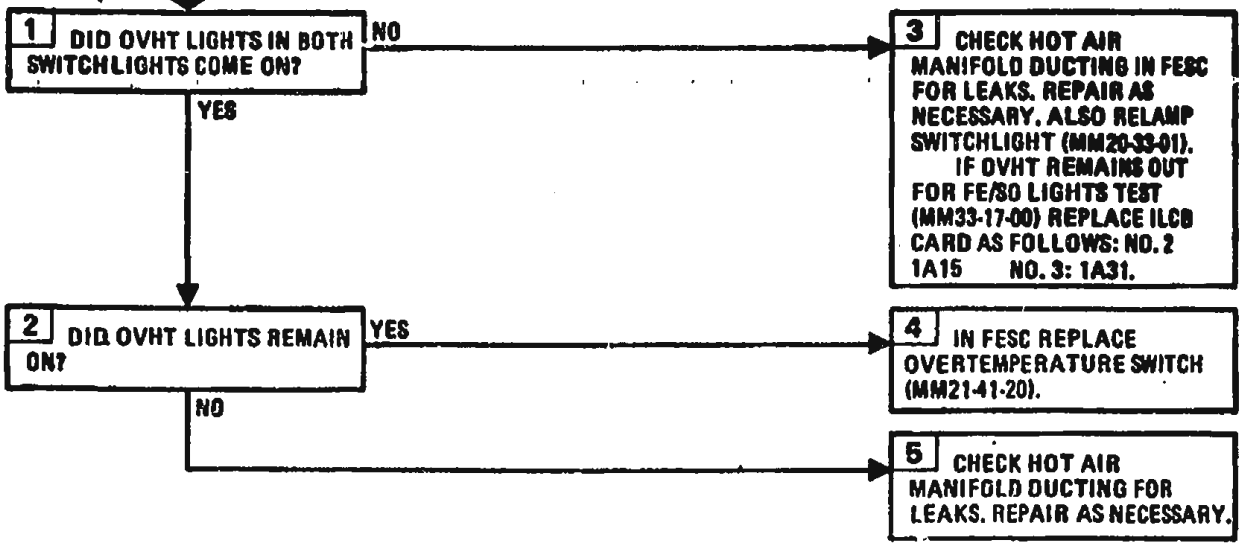
HOT AIR Switchlight Released, Flowbar On, OFF Light On
Figure 105



M1-0003-21-0013

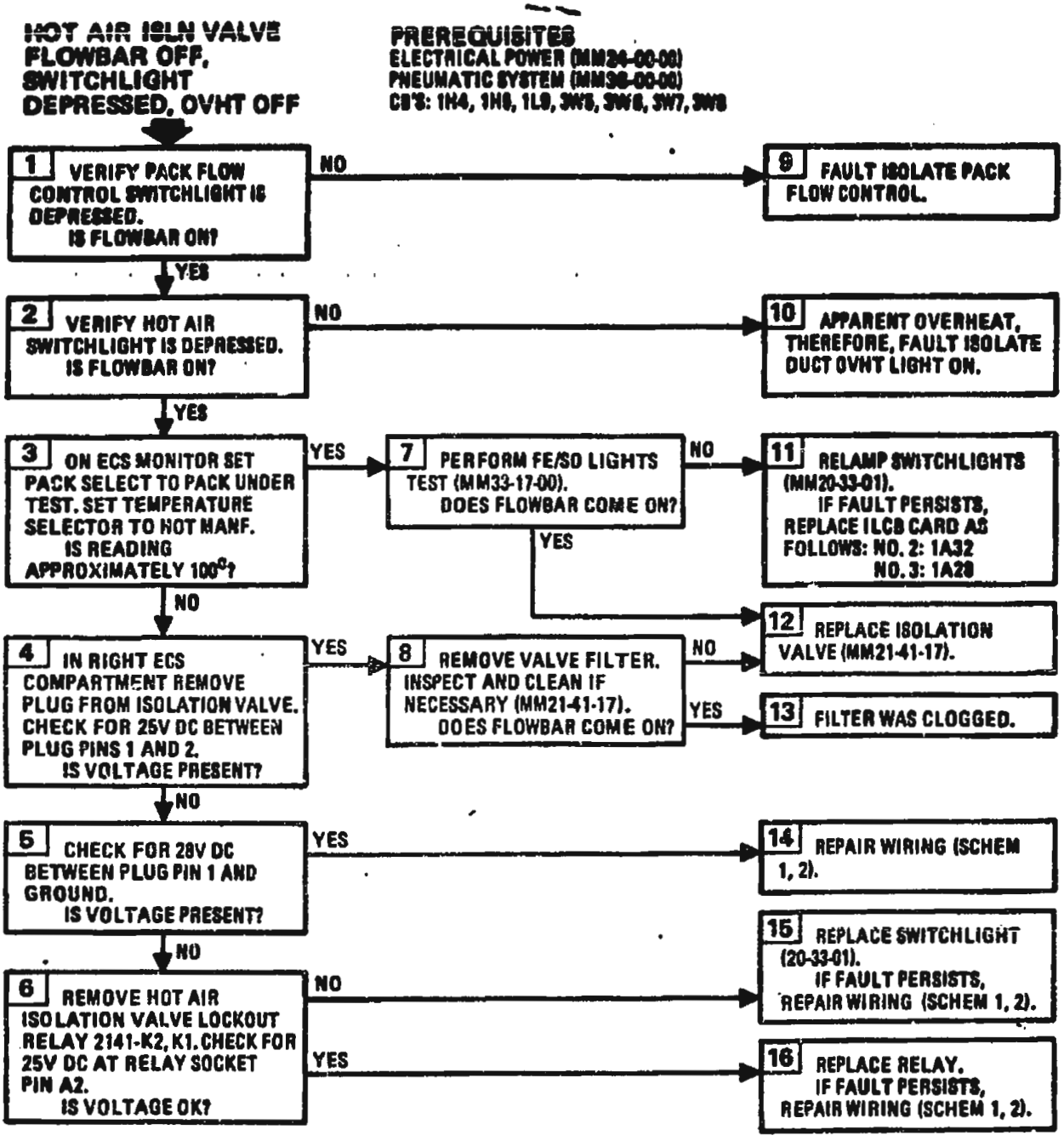
HOT AIR OFF Light Problems
Figure 106

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMETIC SYSTEM (MM36-00-00)
CB'S: 1H4, 1H5, 1L9, 3W5, 3W6, 3W7, 3W8, 3W9
PACK FLOW CONTROL NO. 2 AND NO. 3 SWLTS IN


HOT AIR ISLN VALVE OVHT LIGHT ON
1 DID OVHT LIGHTS IN BOTH SWITCHLIGHTS COME ON?
NO
YES
3 CHECK HOT AIR MANIFOLD DUCTING IN FESC FOR LEAKS. REPAIR AS NECESSARY. ALSO RELAMP SWITCHLIGHT (MM20-33-01). IF OVHT REMAINS OUT FOR FE/SO LIGHTS TEST (MM33-17-00) REPLACE ILCB CARD AS FOLLOWS: NO. 2 1A15 NO. 3: 1A31.
2 DID OVHT LIGHTS REMAIN ON?
YES
NO
4 IN FESC REPLACE OVERTEMPERATURE SWITCH (MM21-41-20).
5 CHECK HOT AIR MANIFOLD DUCTING FOR LEAKS. REPAIR AS NECESSARY.

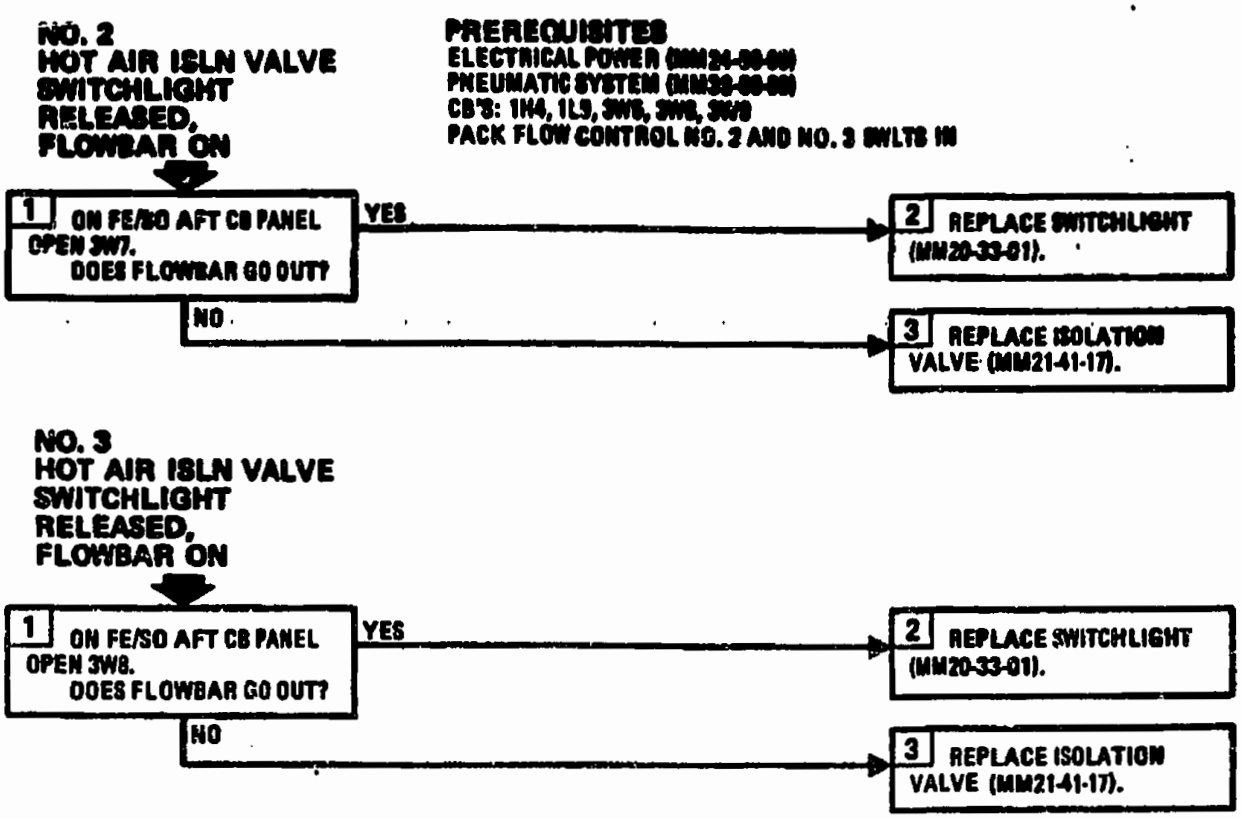
M1-0004-21-5018

Hot Air ISLN VALVE OVHT Light On
Figure 107


HOT AIR ISLN VALVE FLOWBAR OFF, SWITCHLIGHT DEPRESSED, OVHT OFF
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CB'S: 1H4, 1H8, 1L8, 3W5, 3W6, 3W7, 3W8
1 VERIFY PACK FLOW CONTROL SWITCHLIGHT IS DEPRESSED. IS FLOWBAR ON?
NO
9 FAULT ISOLATE PACK FLOW CONTROL.
YES
2 VERIFY HOT AIR SWITCHLIGHT IS DEPRESSED. IS FLOWBAR ON?
NO
10 APPARENT OVERHEAT, THEREFORE, FAULT ISOLATE DUCT OVHT LIGHT ON.
YES
3 ON ECS MONITOR SET PACK SELECT TO PACK UNDER TEST. SET TEMPERATURE SELECTOR TO HOT MANF. IS READING APPROXIMATELY 100°?
YES
7 PERFORM FE/SO LIGHTS TEST (MM33-17-00). DOES FLOWBAR COME ON?
NO
11 RELAMP SWITCHLIGHTS (MM20-33-01). IF FAULT PERSISTS, REPLACE ILCB CARD AS FOLLOWS: NO. 2: 1A32 NO. 3: 1A28
YES
12 REPLACE ISOLATION VALVE (MM21-41-17).
NO
4 IN RIGHT ECS COMPARTMENT REMOVE PLUG FROM ISOLATION VALVE. CHECK FOR 25V DC BETWEEN PLUG PINS 1 AND 2. IS VOLTAGE PRESENT?
YES
8 REMOVE VALVE FILTER. INSPECT AND CLEAN IF NECESSARY (MM21-41-17). DOES FLOWBAR COME ON?
NO
12 REPLACE ISOLATION VALVE (MM21-41-17).
YES
13 FILTER WAS CLOGGED.
NO
5 CHECK FOR 28V DC BETWEEN PLUG PIN 1 AND GROUND. IS VOLTAGE PRESENT?
YES
14 REPAIR WIRING (SCHEM 1, 2).
NO
6 REMOVE HOT AIR ISOLATION VALVE LOCKOUT RELAY 2141-K2, K1. CHECK FOR 25V DC AT RELAY SOCKET PIN A2. IS VOLTAGE OK?
NO
15 REPLACE SWITCHLIGHT (20-33-01). IF FAULT PERSISTS, REPAIR WIRING (SCHEM 1, 2).
YES
16 REPLACE RELAY. IF FAULT PERSISTS, REPAIR WIRING (SCHEM 1, 2).

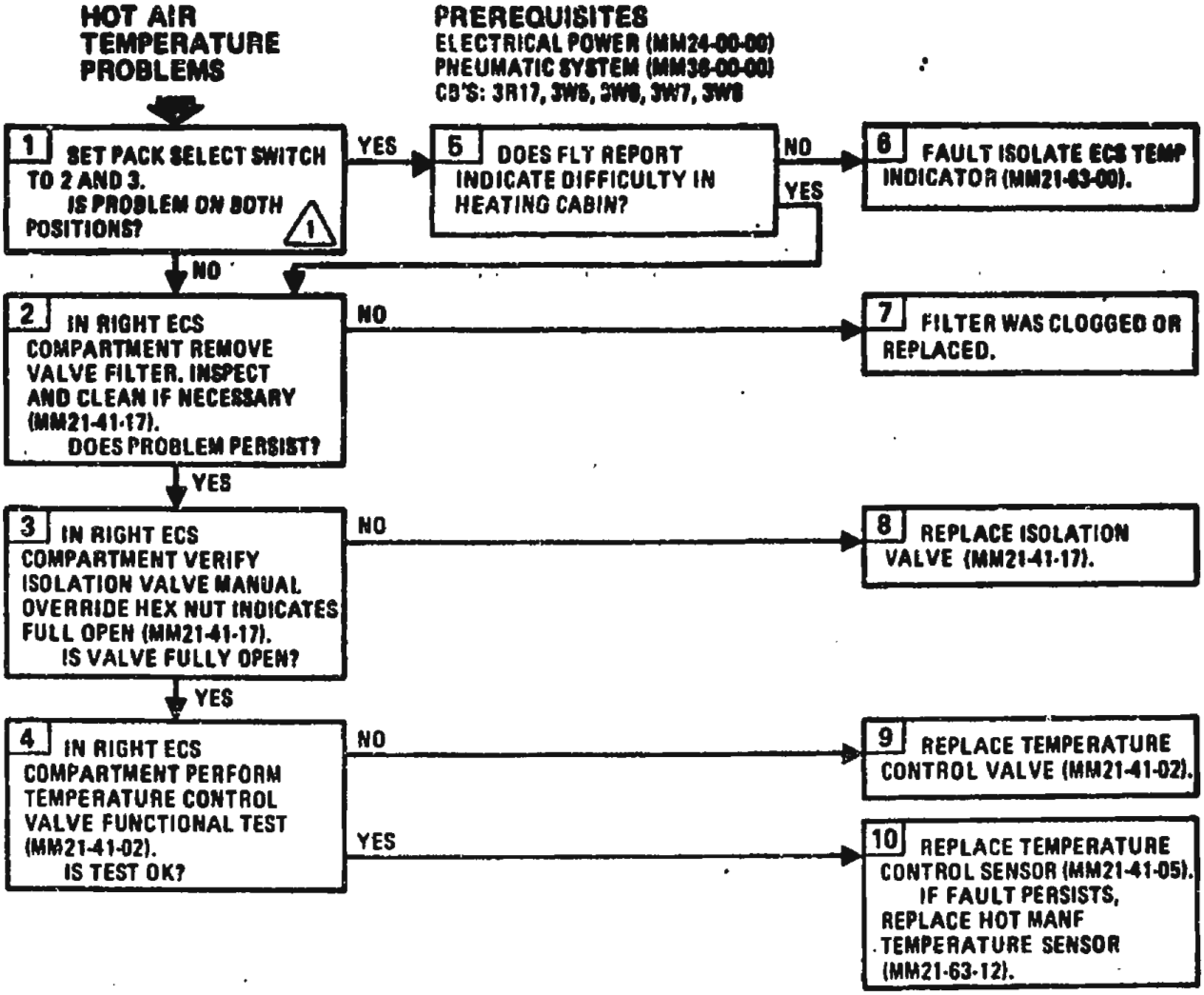
M1-0002-21-8004

Hot Air ISLN VALVE Flowbar Off, Switchlight Depressed, OVHT Off
Figure 108



M1-0002-21-5011

Hot Air ISLN VALVE Switchlight Released, Flowbar On
Figure 109


HOT AIR TEMPERATURE PROBLEMS
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CB'S: 3R17, 3W5, 3W6, 3W7, 3W8
1 SET PACK SELECT SWITCH TO 2 AND 3. IS PROBLEM ON BOTH POSITIONS? 1
YES
5 DOES FLT REPORT INDICATE DIFFICULTY IN HEATING CABIN?
NO
YES
6 FAULT ISOLATE ECS TEMP INDICATOR (MM21-63-00).
NO
2 IN RIGHT ECS COMPARTMENT REMOVE VALVE FILTER. INSPECT AND CLEAN IF NECESSARY (MM21-41-17). DOES PROBLEM PERSIST?
NO
7 FILTER WAS CLOGGED OR REPLACED.
YES
3 IN RIGHT ECS COMPARTMENT VERIFY ISOLATION VALVE MANUAL OVERRIDE HEX NUT INDICATES FULL OPEN (MM21-41-17). IS VALVE FULLY OPEN?
NO
8 REPLACE ISOLATION VALVE (MM21-41-17).
YES
4 IN RIGHT ECS COMPARTMENT PERFORM TEMPERATURE CONTROL VALVE FUNCTIONAL TEST (MM21-41-02). IS TEST OK?
NO
9 REPLACE TEMPERATURE CONTROL VALVE (MM21-41-02).
YES
10 REPLACE TEMPERATURE CONTROL SENSOR (MM21-41-05). IF FAULT PERSISTS, REPLACE HOT MANF TEMPERATURE SENSOR (MM21-63-12).

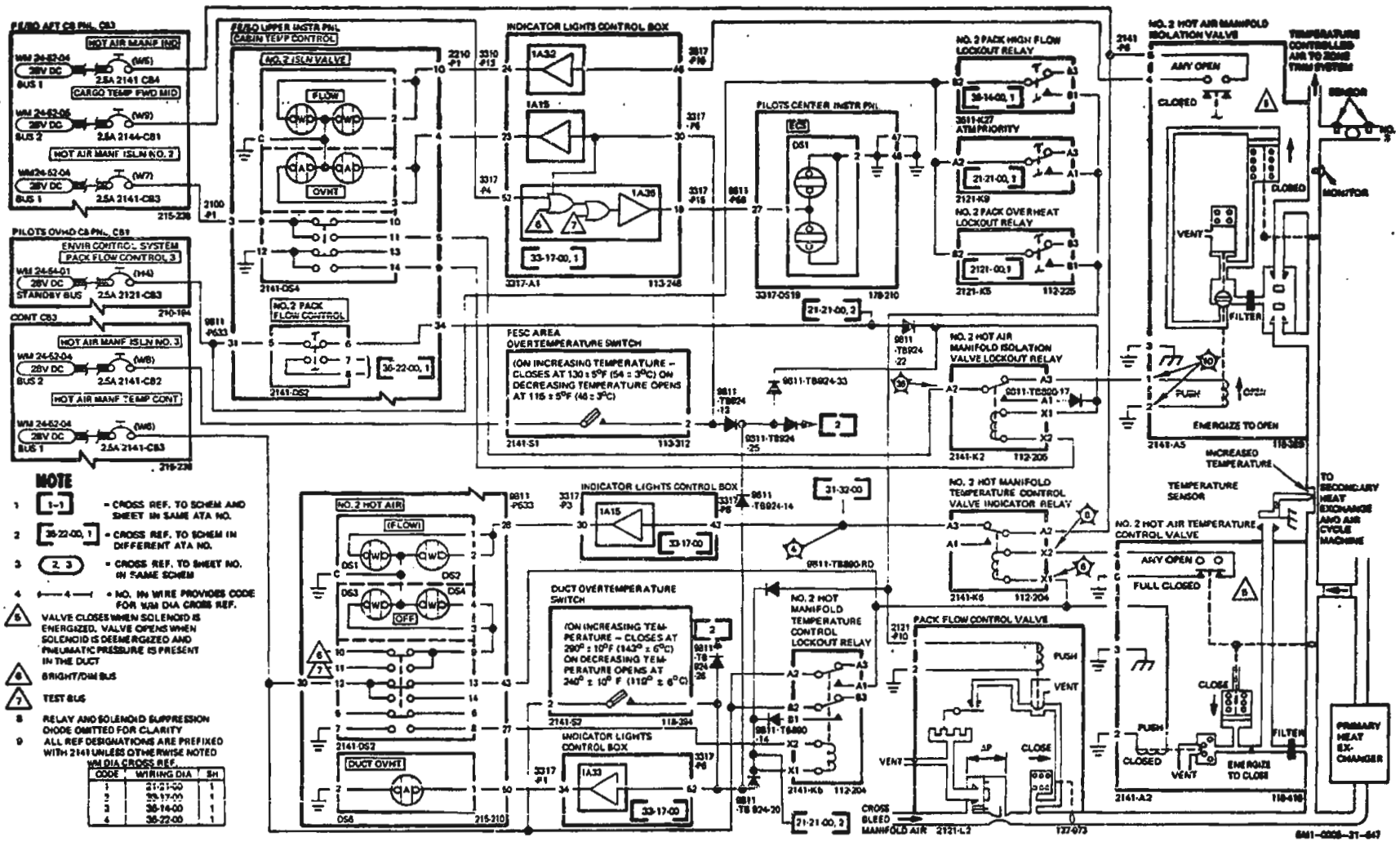
1 NOTE
NORMAL HOT MANIFOLD TEMPERATURE INDICATION IS 116°C ± 10°C

2 LOW HOT MANIFOLD TEMPERATURE OUTPUTS WILL CAUSE CABIN TEMPERATURE CONTROL PROBLEMS

M1-0000-21--2309

C
C Hot Air Temperature Problems
Figure 110

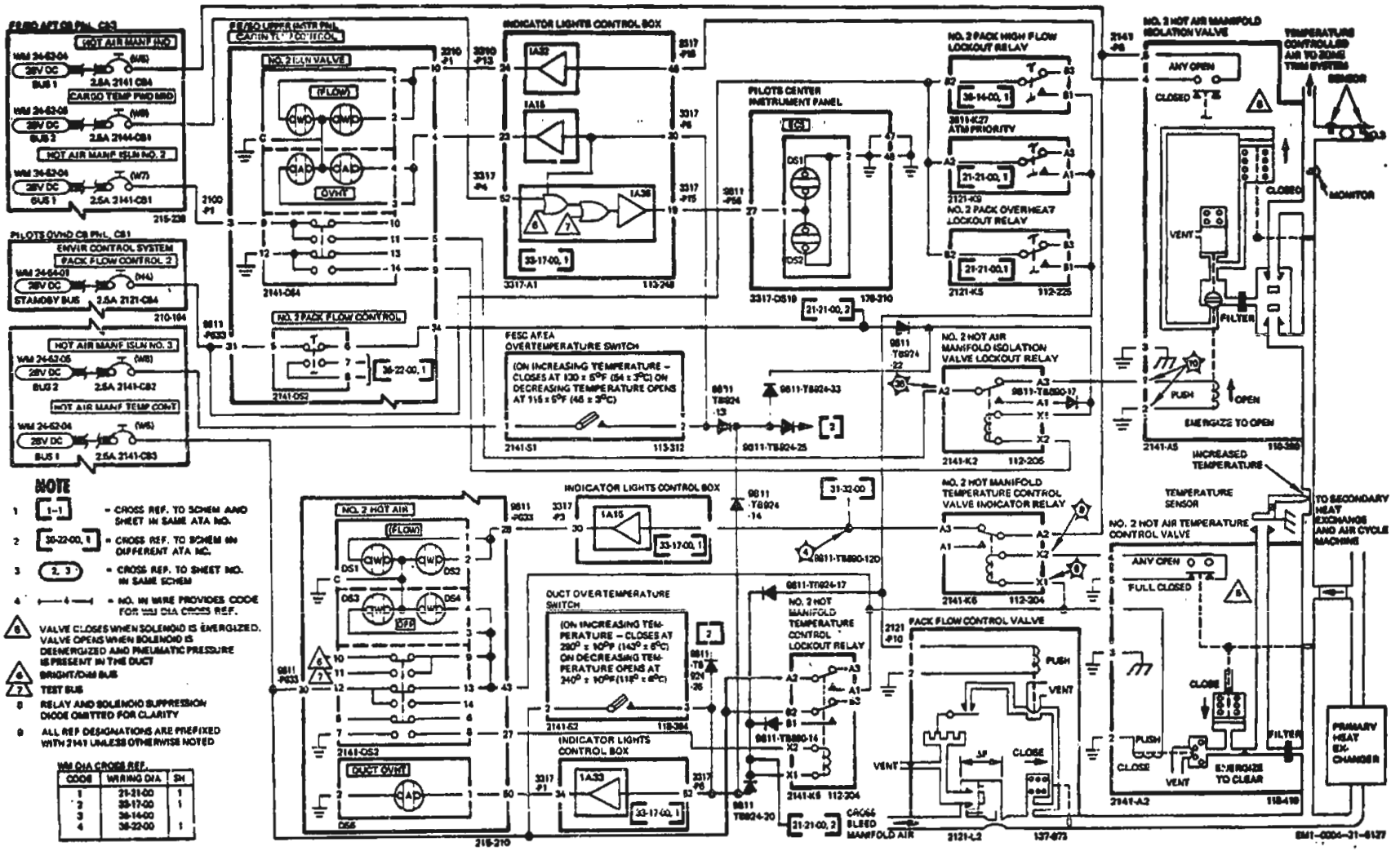
R EFFECTIVITY: ALL
R
001B


NOTE
1 1-1 = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 36-22-00, 1 = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 2, 3 = CROSS REF. TO SHEET NO. IN SAME SCHEM
4 4 = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 VALVE CLOSES WHEN SOLENOID IS ENERGIZED. VALVE OPENS WHEN SOLENOID IS DEENERGIZED AND PNEUMATIC PRESSURE IS PRESENT IN THE DUCT
6 BRIGHT/DIM BUS
7 TEST BUS
8 RELAY AND SOLENOID SUPPRESSION DIODE OMITTED FOR CLARITY
9 ALL REF DESIGNATIONS ARE PREFIXED WITH 2141 UNLESS OTHERWISE NOTED
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 21-21-00 | 1
2 | 33-17-00 | 1
3 | 36-14-00 | 1
4 | 36-22-00 | 1
HOT AIR MANF IND
CARGO TEMP FWD MID
HOT AIR MANF ISLN NO. 2
HOT AIR MANF TEMP CONT
ENVIR CONTROL SYSTEM
PACK FLOW CONTROL 3
NO. 2 ISLN VALVE
NO. 2 PACK FLOW CONTROL
INDICATOR LIGHTS CONTROL BOX
PILOTS CENTER INSTR PNL
NO. 2 PACK HIGH FLOW LOCKOUT RELAY
NO. 2 PACK OVERHEAT LOCKOUT RELAY
FESC AREA OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 130 ± 5°F (54 ± 3°C) ON DECREASING TEMPERATURE OPENS AT 115 ± 5°F (46 ± 3°C)
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
TEMPERATURE CONTROLLED AIR TO ZONE TRIM SYSTEM
SENSOR
MONITOR
VENT
FILTER
PUSH
CLOSED
ENERGIZE TO OPEN
INCREASED TEMPERATURE
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
TEMPERATURE SENSOR
NO. 2 HOT AIR TEMPERATURE CONTROL VALVE
FULL CLOSED
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
DUCT OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 290° ± 10°F (143° ± 6°C) ON DECREASING TEMPERATURE OPENS AT 240° ± 10° F (110° ± 6°C)
PACK FLOW CONTROL VALVE
JP
CLOSE
CROSS BLEED MANIFOLD AIR
PRIMARY HEAT EXCHANGER
DUCT OVHT
OVHT
FLOW
OFF

R No. 2 Hot Air Temperature and Isolation Valves Control Schematic
R SCHEM 1

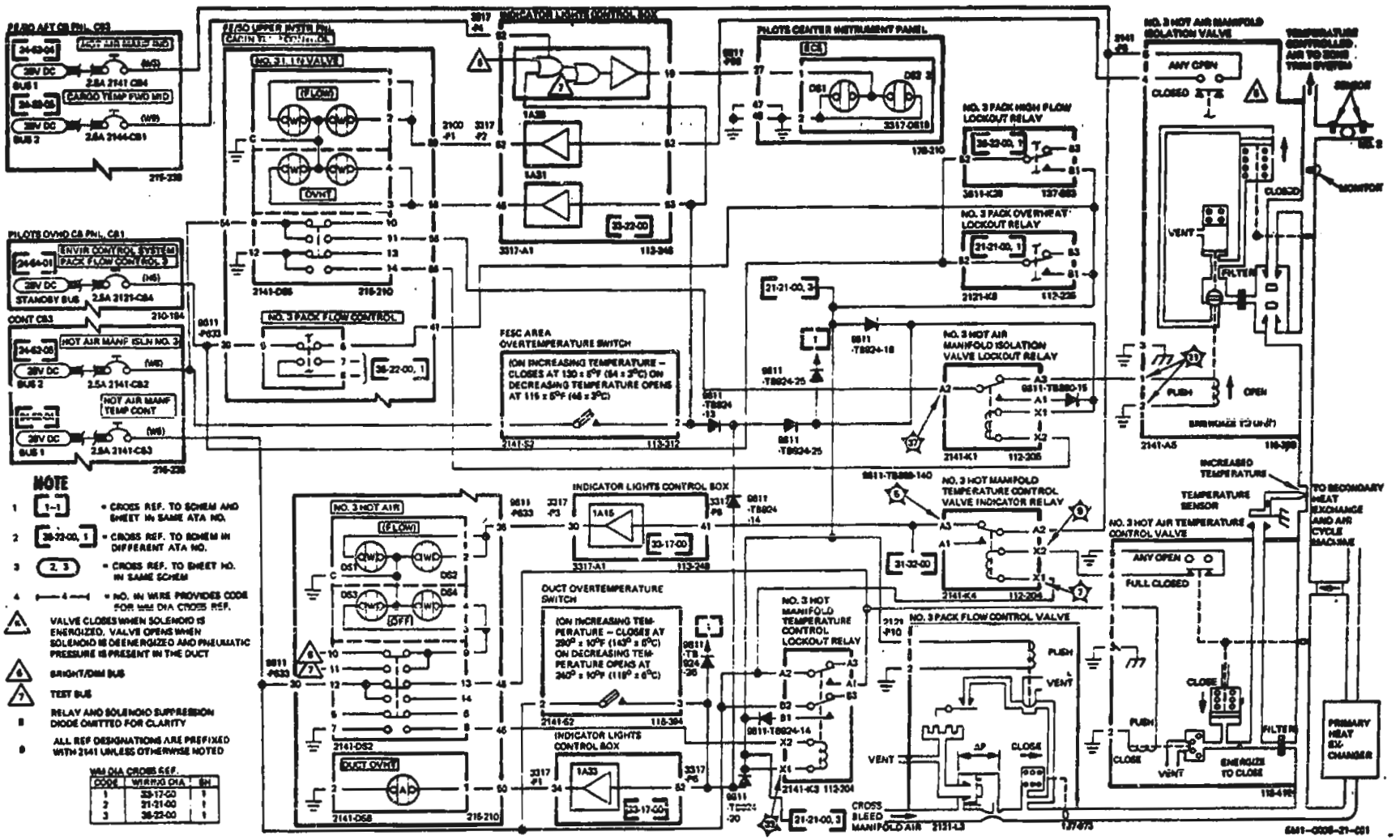
EFFECTIVITY: 001-031 WITHOUT SB21-140

001B


INDICATOR LIGHTS CONTROL BOX
PILOTS CENTER INSTRUMENT PANEL
NO. 2 PACK HIGH FLOW LOCKOUT RELAY
NO. 2 PACK OVERHEAT LOCKOUT RELAY
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
TEMPERATURE CONTROLLED AIR TO ZONE TRIM SYSTEMS
NO. 2 PACK FLOW CONTROL
FESC AFT AREA OVERTEMPERATURE SWITCH
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 2 HOT AIR TEMPERATURE CONTROL VALVE
DUCT OVERTEMPERATURE SWITCH
NO. 2 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
PACK FLOW CONTROL VALVE
TEMPERATURE SENSOR
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
PRIMARY HEAT EX-CHANGER
NOTE
WM DIA CROSS REF.

R No. 2 Hot Air Temperature and Isolation Valves Control Schematic
R SCHEM 1

EFFECTIVITY: 001-031 WITH SB21-140


NOTE
1 1-1 • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 36-22-00, 1 • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 2, 3 • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 4 • NO. IN WIRE PROVIDES CODE FOR WIRING DIA CROSS REF.
5 VALVE CLOSES WHEN SOLENOID IS ENERGIZED. VALVE OPENS WHEN SOLENOID IS DEENERGIZED AND PNEUMATIC PRESSURE IS PRESENT IN THE DUCT
6 BRIGHT/DIM BUS
7 TEST BUS
8 RELAY AND SOLENOID SUPPRESSION DIODE OMITTED FOR CLARITY
9 ALL REF DESIGNATIONS ARE PREFIXED WITH 2141 UNLESS OTHERWISE NOTED
WIRING DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 33-17-00 | 1
2 | 21-21-00 | 1
3 | 36-22-00 | 1
PILOTS CENTER INSTRUMENT PANEL
NO. 3 PACK HIGH FLOW LOCKOUT RELAY
NO. 3 PACK OVERHEAT LOCKOUT RELAY
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE LOCKOUT RELAY
NO. 3 HOT MANIFOLD TEMPERATURE CONTROL VALVE INDICATOR RELAY
NO. 3 HOT AIR TEMPERATURE CONTROL VALVE
NO. 3 PACK FLOW CONTROL VALVE
NO. 3 HOT MANIFOLD TEMPERATURE CONTROL LOCKOUT RELAY
FESC AREA OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 130 ± 5°F (54 ± 3°C) ON DECREASING TEMPERATURE OPENS AT 115 ± 5°F (46 ± 3°C)
DUCT OVERTEMPERATURE SWITCH
(ON INCREASING TEMPERATURE – CLOSES AT 280° ± 10°F (140° ± 6°C) ON DECREASING TEMPERATURE OPENS AT 240° ± 10°F (116° ± 6°C)
INDICATOR LIGHTS CONTROL BOX
TEMPERATURE SENSOR
INCREASED TEMPERATURE
TO SECONDARY HEAT EXCHANGE AND AIR CYCLE MACHINE
PRIMARY HEAT EXCHANGER
CROSS BLEED MANIFOLD AIR
ANY OPEN
FULL CLOSED
CLOSED
OPEN
PUSH
VENT
CLOSE
FILTER
MONITOR
ENERGIZE TO CLOSE

R No. 3 Hot Air Temperature and Isolation Valves Control Schematic
R SCHEM 2

EFFECTIVITY: ALL

001B

HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE - MAINTENANCE PRACTICES

1. General

The hot air manifold temperature control valves are in the right environmental control system (ECS) compartment, zone 118. The No. 2 system valve is near the inboard bulkhead, approximately 28 inches forward of the aft bulkhead. The No. 3 system valve is on the outboard side, just aft of the compartment access door.

2. Maintenance Practices

A. Deactivation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION
R UNTIL COMPLETION OF PROCEDURE.

R RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Open ECS compartment access door 118CR.

NOTE: Valves are normally spring-loaded toward closed, check valve position indicator on valve body.

(2) If valve is at any position other than fully closed, use 1/2-inch wrench on manual override hex to close valve.

(3) When position indicating lever is in the fully SHUT position, tighten manual lock screw (triwing) to hold valve in closed position.

(4) Use 1/2-inch wrench on manual override hex to verify valve is locked in closed position.

(5) Close access door opened in Step 2A(1).

(6) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard applicable HOT AIR switchlight(s) HOT AIR MANIFOLD VALVE INOPERATIVE.

(7) Make appropriate entry in aircraft log book.

1. General

The two hot air manifold temperature control valves are installed in the right environmental control system (ECS) compartment, zone 118. They are in ducts taking uncooled primary heat exchanger inlet air from the No. 2 and 3 air cycle systems.

The No. 2 system temperature control valve is near the top of the compartment, next to the inboard bulkhead, approximately 28 inches forward of the aft bulkhead. The No. 3 system valve is on the outboard side of the compartment, just aft of the access door (Ref. Fig. 401). Removal and installation procedures for the two valves are the same.

2. Equipment and Materials

Hot Air Manifold Temperature Control Valve:

Pneumatic Coupling Seals

R Packing, MS9385-06, or equivalent

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps and plugs

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Valve Air Filter:

Filter (Hamilton Standard PN 727604-4)

3. Referenced Procedures

06-40-00	Exterior Access Door and Panels Zone 100
20-21-01	Flexible Swaged Coupling - Removal and Installation
20-36-01	Single T-bolt V-band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation - Hot Air Manifold Temperature Control Valve

A. Removal

(1) Tag Flight Engineer/Second Officers, ENGINE BLEED CONTROL panel and APU CONTROL panel, to prevent system operation until completion of procedure.

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

HOT AIR MANF - IND (W5),

HOT AIR MANF - TEMP CONT (W6).

(3) Tag the three high pressure ground air connections, to prevent system operation until completion of procedure.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(4) Open ECS compartment access door 118CR (Ref. 06-40-00).

(5) Disconnect electrical cable connector from valve receptacle.

(6) Install protective caps on connector and receptacle and stow electrical cable to prevent damage.

(7) Disconnect control pressure tube from union in TEMP SENSOR port on valve actuator.

(8) Remove union and pneumatic coupling seal from port and discard pneumatic coupling seal.

(9) Install protective plugs in tube fitting and in valve port.

(10) Cut lockwire and disconnect flexible swaged coupling (Ref. 20-21-01) at discharge end of valve. Use two strap wrenches if necessary. Work coupling retainer from valve and duct flanges, forward onto duct.

(11) Disconnect single T-bolt V-band coupling (Ref. 20-36-01) at inlet end of valve. Move coupling aft onto duct.

(12) Support valve and remove screw, washer, and nut securing valve bracket to support structure.

(13) Remove valve by sliding from between ends of ducts.

(14) Remove flexible swaged coupling components from duct and valve and discard pneumatic coupling seals.

(15) Install protective caps on exposed ends of ducts and valve.

B. Installation

(1) Verify that all tags installed in Steps 4A(1), (2) and (3) are in place.

WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

(2) Remove protective caps and clean duct and valve flanges and flexible swaged coupling components with M.E.K. or equivalent solvent. Inspect for damage and replace any damaged component.

(3) Lubricate flexible swaged coupling components with non-hardening silicone lubrication, Viscasil 10000 or equivalent (packing, washers, retainer, and threads of body and nut). Wipe all lubricant from wrenching surfaces of body and nut.

(4) Check direction of flow arrow on body of valve and install the coupling nut, one washer, and one pneumatic coupling seal on discharge end of valve. Slide washer and pneumatic coupling seal into nut.

(5) Install coupling body, one washer, and one pneumatic coupling seal on duct forward of valve position. Slide washer and pneumatic coupling seal into body.

(6) Work retainer over flange of duct, completely onto duct next to coupling body.

(7) Verify single T-bolt V-band coupling is on duct aft of valve position.

(8) With the flow arrow on the valve body pointing forward, slide valve into position between duct ends.

(9) Work retainer from duct into position over valve and duct flanges and mate flexible swaged coupling components (Ref. 20-21-02) at discharge end of valve. Do not tighten coupling.

(10) Install single T-bolt V-band coupling (Ref. 20-36-01) at inlet end of valve. Do not tighten coupling.

(11) Rotate valve as necessary and install screw, washer, and nut securing valve bracket to support structure.

(12) Torque single T-bolt V-band coupling (Ref. 20-36-01).

(13) Position discharge duct for minimum misalignment and torque and lockwire flexible swaged coupling (Ref. 20-21-02).

(14) Remove protective plug from TEMP SENSOR port in valve actuator, lubricate new pneumatic coupling seal, install pneumatic coupling seal on union, and install union with pneumatic coupling seal in port.

(15) Connect control pressure tube to union.

(16) Remove protective caps and connect electrical cable connector to valve receptacle.

(17) Remove all tags and close circuit breakers opened in Steps 4A(1), (2) and (3).

(18) Turn on air conditioning system (Ref. 21-00-00).

(19) Operate air conditoning system to close and to open temperature control valve and to vary usage of trim air from minimum to maximum.

(20) Check temperature control valve installation for leaks and verify that valve closes and opens and that valve position modulates, with amount of valve opening proportional to demand for trim air usage.

(21) Turn off air conditioning system (Ref. 21-00-00).

(22) Close ECS compartment access door 118CR.

5. Removal/Installation - Valve Air Filter

A. Removal

(1) Tag Flight Engineer/Second Officers, ENGINE BLEED CONTROL panel and APU CONTROL panel, to prevent system operation until completion of procedure.

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

HOT AIR MANF - IND (W5),

HOT AIR MANF - TEMP CONT (W6).

(3) Tag the three high pressure ground air connections, to prevent system operation until completion of procedure.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(4) Open ECS compartment access door 118CR (Ref. 06-40-00).

(5) Remove screw thread plug, preformed packing, helical spring and air filter (Ref. Fig. 401).

(6) Inspect preformed packing on plug. If damaged replace packing (Hamilton Standard PN 69494J910).

(7) Inspect Helical Compression spring. If damaged replace spring (Hamilton Standard PN 727591-6).

B. Installation

(1) Verify that all tags installed in 5A(1), (2) and (3) are in place.

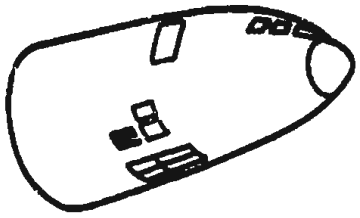
CAUTION: FILTER MUST BE INSTALLED FLANGED END FIRST (REF. FIG. 401).

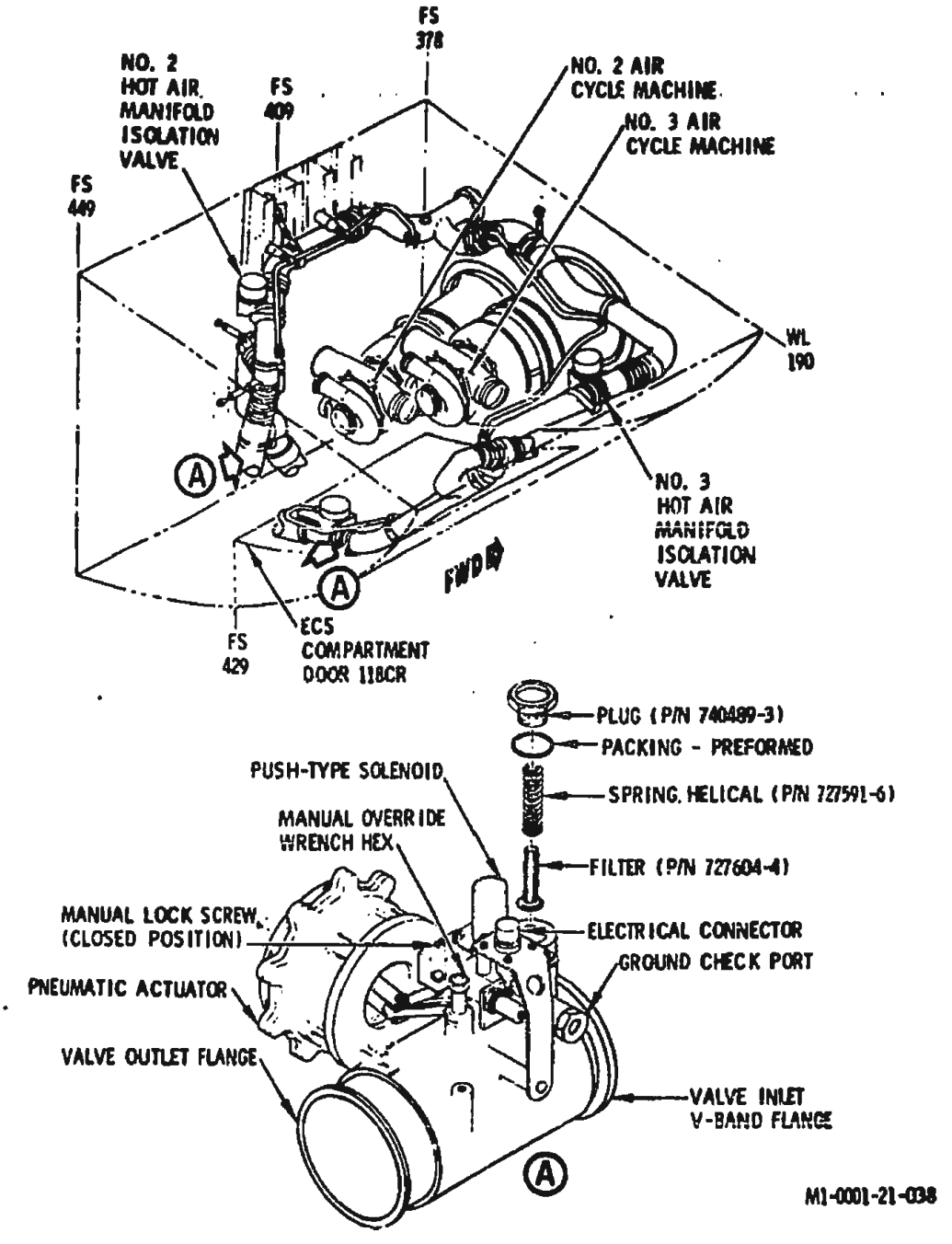
(2) Install filter, Hamilton Standard PN 727604-4, (flanged end first) followed by spring, preformed packing and plug (Ref. Fig. 401).

R (3) Tighten plug to a torque of 60 to 70 pound-inch and
R lock-wire.

(4) Close ECS Compartment access door 118CR.

(5) Remove all tags and close circuit breakers opened in Steps 5A(1), (2) and (3).





Hot Air Manifold Temperature Control Valve
Removal and Installation
Figure 401

HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE - ADJUSTMENT AND TEST

1. General

The pack No. 2 and pack No. 3 hot air manifold temperature control valves may be tested with an external pressure source. Satisfactory completion of the test verifies operation of the shutoff solenoid, actuator, and position limit switch. Adjustments cannot be made on the aircraft. If adjustment is required, the valve must be removed and sent to a shop with suitable pneumatic test equipment.

2. Equipment and Materials

Valve Tester, Hamilton Standard PN GS9400-7, or equivalent

Test Plug, Hamilton Standard PN GS14111-1, or 14123-1 or equivalent

Preformed Packing, Hamilton Standard PN 69494J904, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Adjustment/Test

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL
R COMPLETION OF PROCEDURE.

R RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

A. Functional Test

(1) Open environmental control system (ECS) compartment door 118CR.

(2) Remove plug from ground check port (Ref. Fig. 501) and discard preformed packing. Install test plug in ground check part.

(3) Connect valve tester air output to test plug.

(4) Turn on electrical power (Ref.24-00-00).

(5) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, ensure that associated HOT AIR switchlight is depressed (latched in).

(6) Apply 11 psig air pressure to ground check port. Valve must open and flow bar in HOT AIR switchlight must come on.

(7) Remove air pressure to ground check port. Valve must close and flow bar must go off.

(8) Reapply air pressure to ground check port. Valve must open and flow bar must come on.

(9) Place HOT AIR switchlight in released (out) position. Valve must close, flow bar must go off, and OFF indicator light must come on.

(10) Remove air pressure.

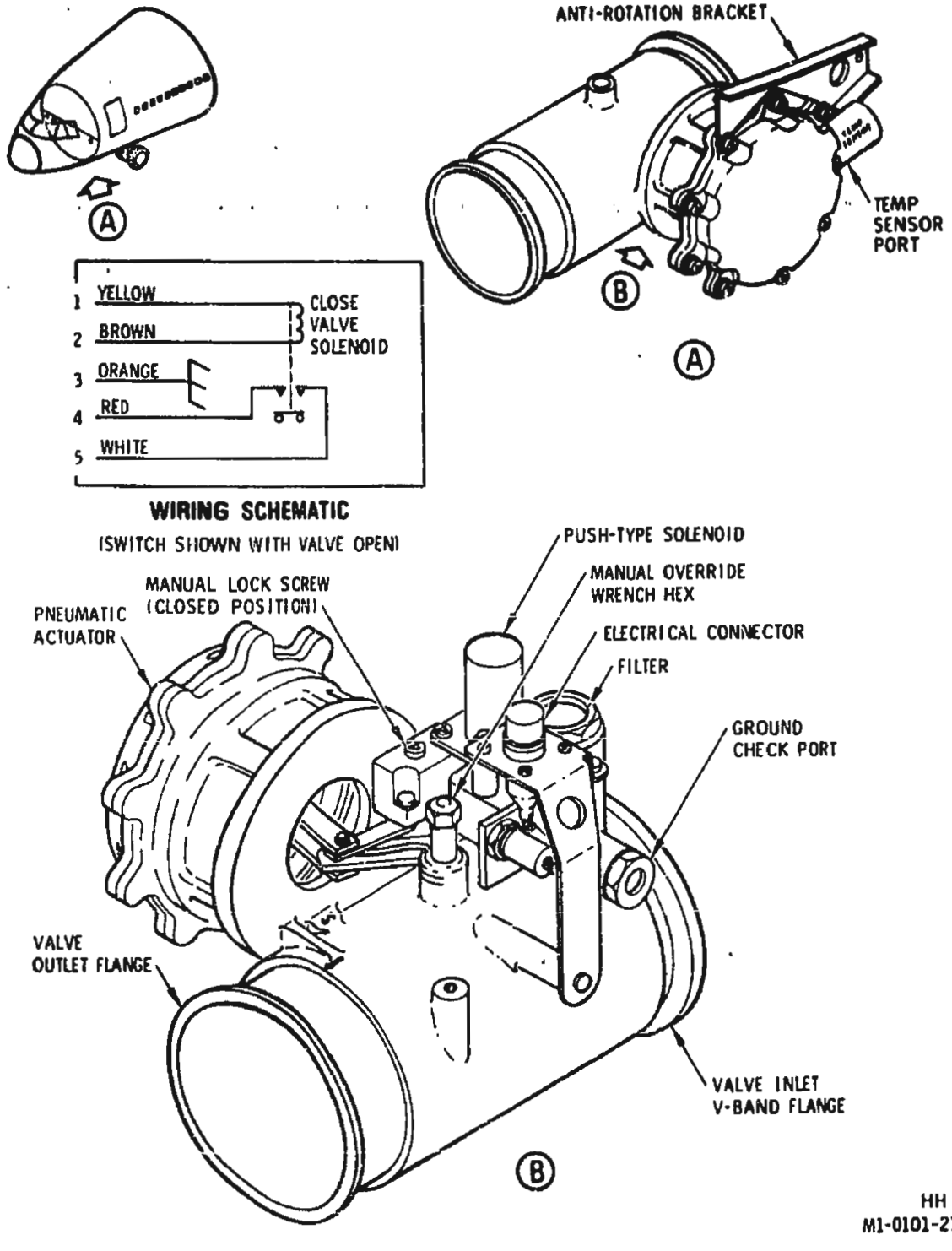
(11) Turn off electrical power (Ref. 24-00-00).

(12) Disconnect valve tester and remove test plug from ground check port.

(13) Install new packing on valve plug and reinstall plug in ground check port. Tighten 25 to 30 lb in. and lock-wire.

(14) Close ECS compartment door.

(15) Remove tags installed in Step 4.



R Temperature Control Valve - Adjustment and Test
R Figure 501

R HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE - INSPECTION AND CHECK

R 1. General

R Inspection of the pack No. 2 and 3 hot air manifold temperature control valve filters should be made in accordance with airline time limits and maintenance standards. There is no check procedure required, other than visual check of the valve installation whenever area is open.

R 2. Equipment and Materials

R Solvent, AMS3160B, or equivalent

R Soft-bristle brush

R Preformed Packing, Hamilton Standard PN 6949J910, or equivalent

R 3. Inspection/Check

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE. RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURE. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

R A. Inspection

R (1) Open environmental control system (ECS) door 118CR.

R (2) Remove filter hex nut, spring, and filter element.
R Remove and packing from filter element and retain.

R (3) Inspect filter element for clogged or dirty pores.

R WARNING: OBSERVE STANDARD SHOP PRECAUTIONS WHEN USING
R COMPRESSED AIR.

R CAUTION: USE COMPRESSED AIR CAREFULLY TO PREVENT
R DAMAGE TO FINE-MESH SCREEN OF FILTER ELEMENT.

R (4) Clean dirty filter element by agitating in clean
R solvent and brushing with soft-bristle brush. Dry
R filter element using dry, filtered, compressed air.

R (5) Inspect filter packing; replace if damaged.

R (6) Reinstall filter, spring, and packing. Tighten filter
R hex nut 60 to 70 lb in. and lock-wire.

R (7) Close ECS compartment door.

R (8) Remove tags installed at beginning of Paragraph 4.

HOT AIR MANIFOLD TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

Deactivation for an inoperative hot air manifold sensor is accomplished by deactivation of the hot air manifold temperature control valve normally controlled by the inoperative sensor.

2. Referenced Procedure

21-41-02 Hot Air Manifold Temperature Control Valve - Maintenance Practices

3. Maintenance Practices

A. Deactivation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION
R UNTIL COMPLETION OF PROCEDURE.

R RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Deactivate hot air manifold temperature control valve(s) normally controlled by inoperative hot air manifold temperature sensor(s) (Ref. 21-41-02).

(2) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, placard applicable HOT AIR switchlight TEMP SENSOR INOPERATIVE, VALVE DEACTIVATED.

(3) Make appropriate entry in aircraft log book.

HOT AIR MANIFOLD TEMPERATURE CONTROL SENSOR REMOVAL AND INSTALLATION

1. General

The two hot air manifold temperature control sensors are installed in the right environmental control (ECS) compartment, zone 118, in the ducting carrying mixed temperature controlled air from the No. 2 and 3 air cycle system (Ref. Fig. 301).

The No. 2 system temperature control sensor is above the No. 2 air cycle machine (ACM) and the No. 3 system sensor is above and inboard of the No. 3 ACM. The No. 3 ACM inlet shell and diffuser housing must be slid forward, into the heat exchanger area, to provide space for access to the hot air manifold temperature control sensors (Ref. Fig. 401).

2. Equipment and Materials

Gasket, PN 1543149-101, or equivalent

O-ring, MS9385-06, or equivalent

Protective plugs

R Wire, 0.025-inch diameter FED SPEC QQ-W-423, or equivalent

3. Referenced Procedure

06-40-00	Exterior Access Doors and Panels Zone 100
21-00-00	Air Conditioning System - Maintenance Practices
21-51-07	Air Cycle Machine - Removal and Installation

4. Removal/Installation

A. Removal

(1) Tag Flight Engineer/Second Officers BLEED AIR CONTROL panel and APU CONTROL panel to prevent system operation until completion of procedure.

(2) Tag the three high pressure ground air connections, to prevent system operation until completion of procedure.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(3) Open ECS compartment access door 118CR (Ref. 06-40-00).

(4) In ECS compartment, move No. 3 ACM inlet shell and diffuser housing forward, into heat exchanger area (Ref. 21-51-07) for access to sensor.

NOTE: Increased access room may be obtained by removing the four rivets attaching quick disconnect fitting to bottom of the ACM inlet shell. With fitting removed inlet shell may be slid completely into heat exchanger inlet bellmouth. Reattach fitting to inlet shell with
R drilled head bolts and nuts, and lock-wire bolt heads inside inlet shell after sensor installation.

(5) Disconnect pneumatic tube from sensor fitting.

(6) Remove fitting and O-ring from sensor, discard O-ring.

(7) Install protective plugs in tube and in sensor port.

(8) Remove screws securing sensor to mounting boss on duct.

CAUTION: DO NOT ALLOW SENSOR TO BECOME COCKED IN MOUNTING BOSS.

(9) Carefully draw sensor straight out of duct until clear of mounting boss.

(10) Remove and discard gasket.

B. Installation

(1) Verify that all tags installed in Steps 4A(1) and (2) are in place.

(2) Ensure that sensor and mounting flange surfaces are clean.

(3) Install new gasket on sensor.

CAUTION: DO NOT ALLOW SENSOR TO BECOME COCKED IN MOUNTING BOSS.

(4) Carefully insert sensor straight into mounting hole.

(5) Check that gasket is correctly positioned, and install mounting screws.

(6) Remove protective plug from sensor port, install new O-ring on union, and install union in sensor port.

(7) Remove protective plug from pneumatic tube and connect tube to union.

(8) Install No. 3 ACM diffuser housing and inlet shell (Ref. 21-51-07).

(9) Remove all tags installed in Steps 4A(1) and (2).

WARNING: DO NOT OPERATE AIR CONDITIONING SYSTEM BEFORE VERIFYING PROPER INSTALLATION OF NO. 2 AND 3 ACM DIFFUSER HOUSINGS AND INLET SHELLS.

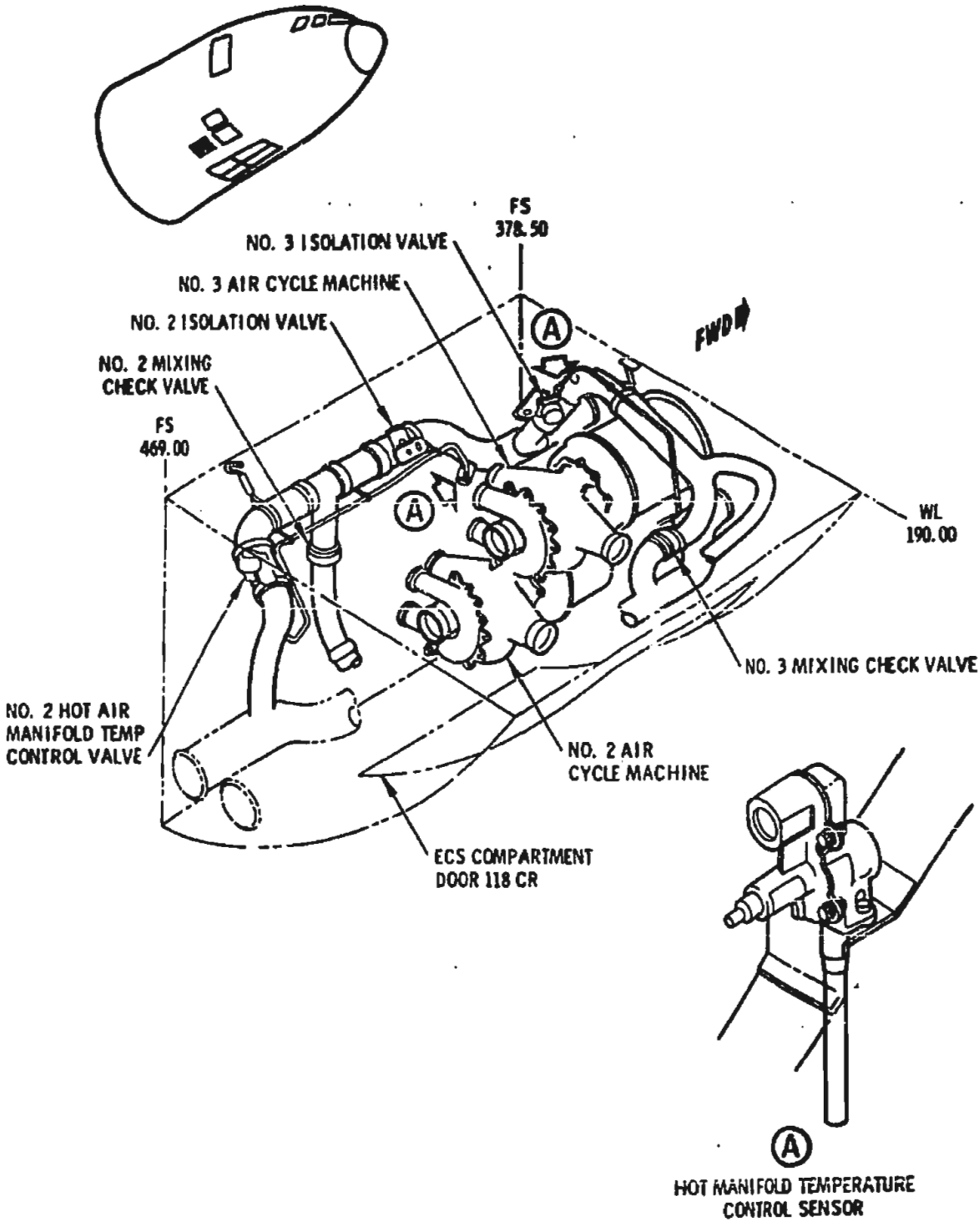
R (10) Turn on air conditioning system (Ref. 21-00-00).

(11) In ECS compartment, check sensor installation for leaks.

(12) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, use ECS temperature indicator to verify sensor operation by monitoring HOT MANF temperature
CR from applicable air cyclepack. Stabilized temperature
CR should be 112 degrees ± 16 degrees C.

(13) Turn off air conditioning system (Ref. 21-00-00).

(14) Close ECS compartment access door.

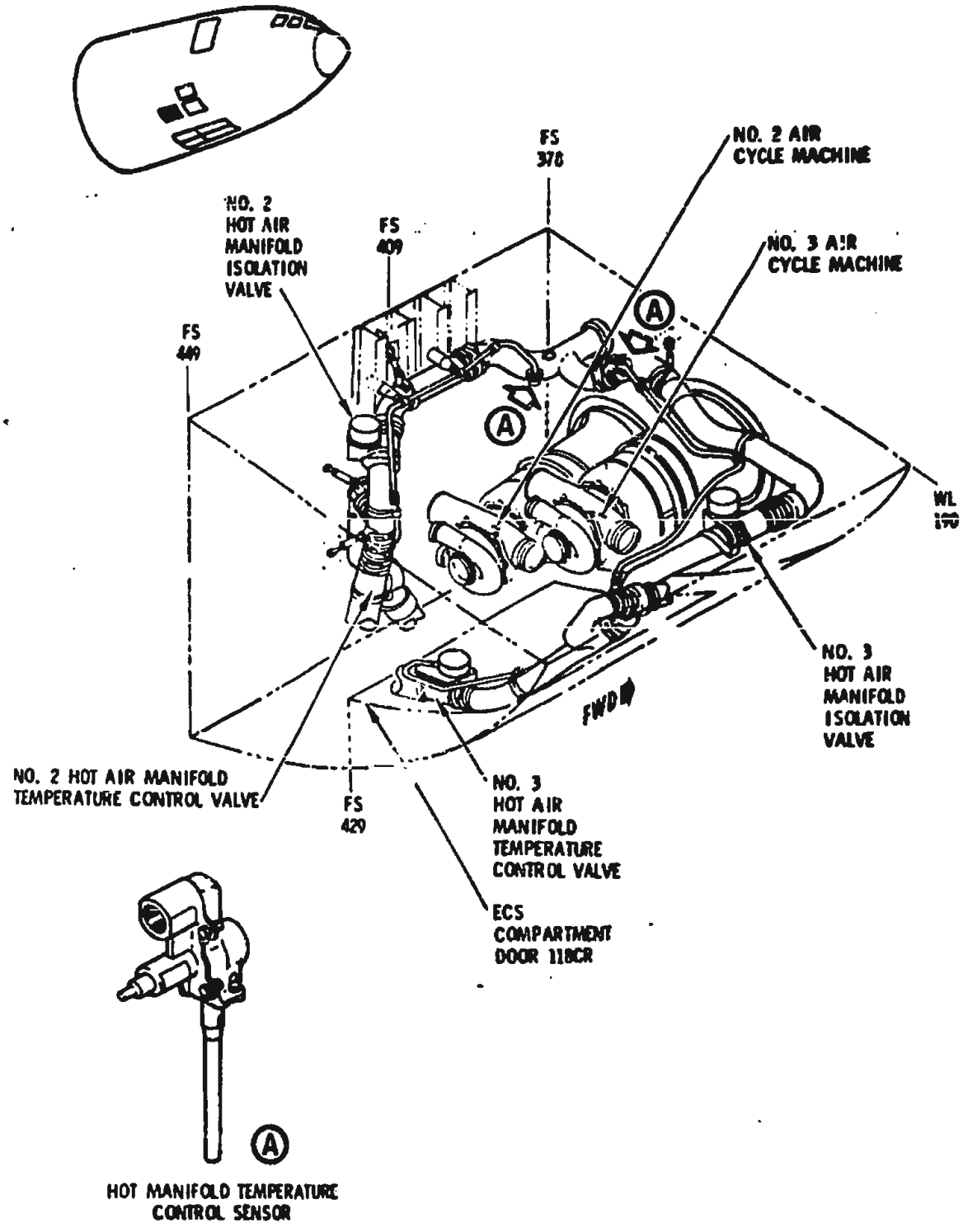


M1-0000-21-1576

R Hot Air Manifold Temperature Control Sensor - Removal and
R Installation
R Figure 401

R EFFECTIVITY: 001-023 WITHOUT SB21-077

R
001B


FS 378
NO. 2 AIR CYCLE MACHINE
NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
FS 409
NO. 3 AIR CYCLE MACHINE
FS 449
WL 170
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE
FWD
NO. 2 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
FS 429
NO. 3 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
ECS COMPARTMENT DOOR 118CR
A
HOT MANIFOLD TEMPERATURE CONTROL SENSOR

M1-0000-21-1577

R Hot Air Manifold Temperature Control Sensor - Removal and
R Installation
R Figure 401

EFFECTIVITY: 001-023 WITH SB21-077 AND 024-999

0018

HOT AIR MANIFOLD TEMPERATURE CONTROL SENSOR - ADJUSTMENT AND TEST

1. Adjustment/Test

The pack No. 2 and 3 hot air manifold temperature control sensors cannot be tested on the aircraft. If the associated temperature control valve is not operating correctly, but ground-checks satisfactorily, and if no leaks can be found in the sensor plumbing, the sensor may be assumed to be faulty.

Adjustment cannot be made on the aircraft. If adjustment is required, the sensor must be removed and sent to a shop with appropriate pneumatic test equipment.

HOT AIR MANIFOLD MIXING CHECK VALVE - REMOVAL AND INSTALLATION

1. General

The two hot air manifold mixing check valves are installed in the right environmental control system (ECS) compartment, zone 118. They are in ducts taking partially cooled primary heat
R exchanger discharge air from the No. 2 and 3 air cycle systems. The No. 2 system mixing check valve is inboard of the No. 2 air cycle machine (ACM), near the compartment inboard bulkhead.

On aircraft 001-019 without SB21-077, the No. 3 system mixing check valve is outboard and slightly forward of the No. 3 ACM (Ref. Fig. 401).

On aircraft 001-019 with SB21-077, the No. 3 system mixing check valve is outboard and slightly aft of the No. 3 air cycle machine (ACM) near the compartment ceiling (Ref. Fig. 401).

2. Equipment and Materials

O-rings (2), MS9068-342, or equivalent

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

R	06-40-00	Exterior Access Doors and Panels Zone 100
	20-21-01	Flexible Swaged Coupling - Removal and Installation
	20-36-01	Single T-bolt V-band Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers ENGINE BLEED
R CONTROL panel and APU CONTROL panel, to prevent system
R operation until completion of procedure.

R (2) Tag the three high pressure ground air connections, to
R prevent system operation until completion of procedure.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (3) Open ECS compartment access door 118CR (Ref. 06-40-00).

R (4) In ECS compartment, locate applicable mixing check valve (Ref. Fig. 401), cut lockwire and disconnect flexible swaged coupling (Ref. 20-21-01) at discharge end of valve. Use two strap wrenches if necessary.

NOTE: On aircraft 001-019 without SB21-077, the discharge end of the No. 2 valve is up, and the discharge end of the No. 3 valve is forward. discharge end of the No. 3 valve is forward.

NOTE: On aircraft 001-019 with SB21-077, the discharge end of the No. 2 valve is aft and outboard while the discharge end of the No. 3 valve is aft.

R (5) Slide coupling nut, washer, and O-ring back onto body
R of valve (cut and discard O-ring if necessary).

R (6) Slide coupling body, washer, and O-ring back onto duct
R (cut and discard O-ring if necessary).

R (7) Remove retainer from over valve and duct flanges.

R (8) Disconnect single T-bolt V-band coupling at inlet end
R of valve (Ref. 20-36-01) and slide coupling back onto
R duct.

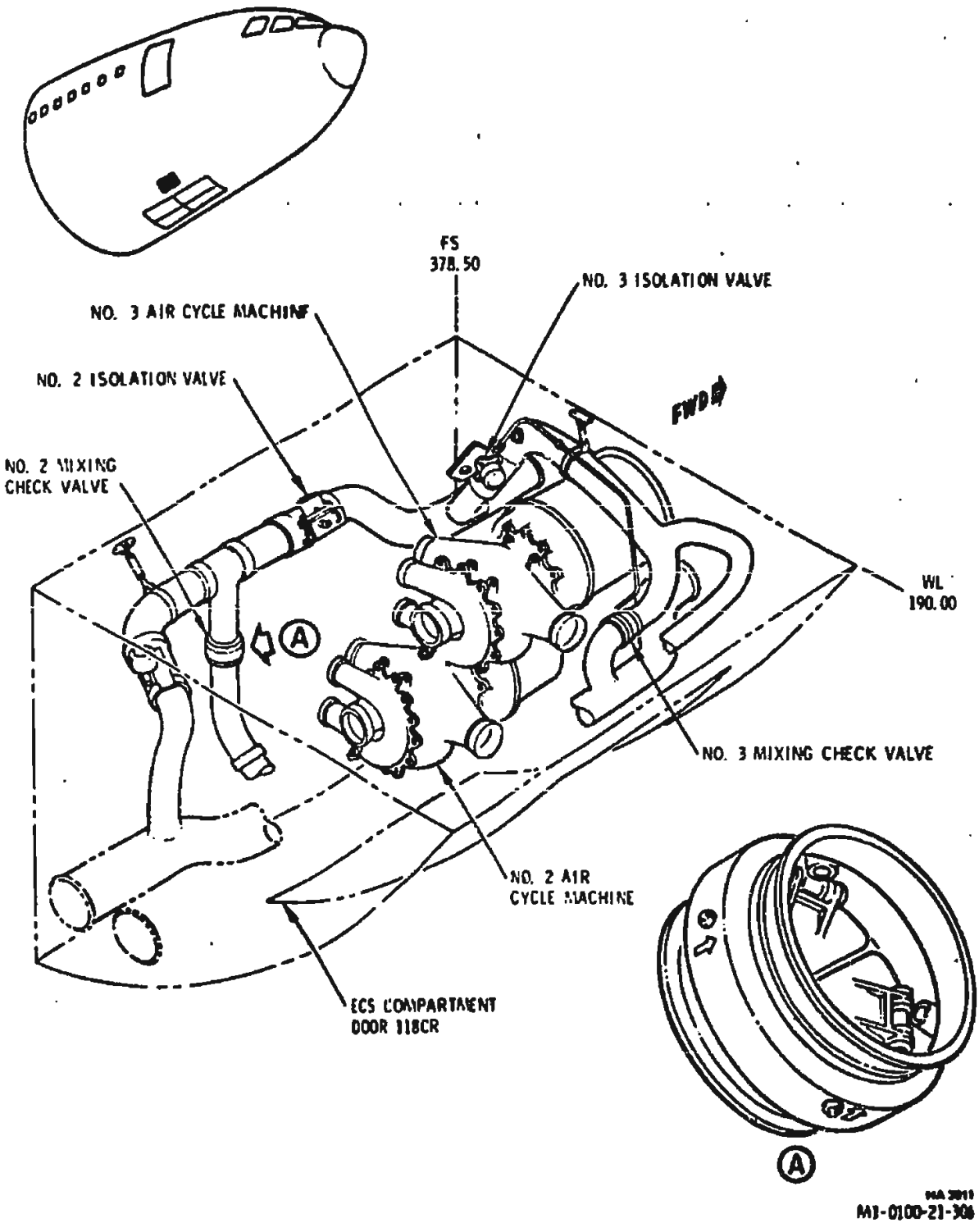
R (9) Remove valve by sliding from between ends of ducts.

R (10) Remove flexible swaged coupling components from duct
R and valve and discard O-rings.

R (11) Install protective caps on exposed ends of ducts and valve.

B. Installation

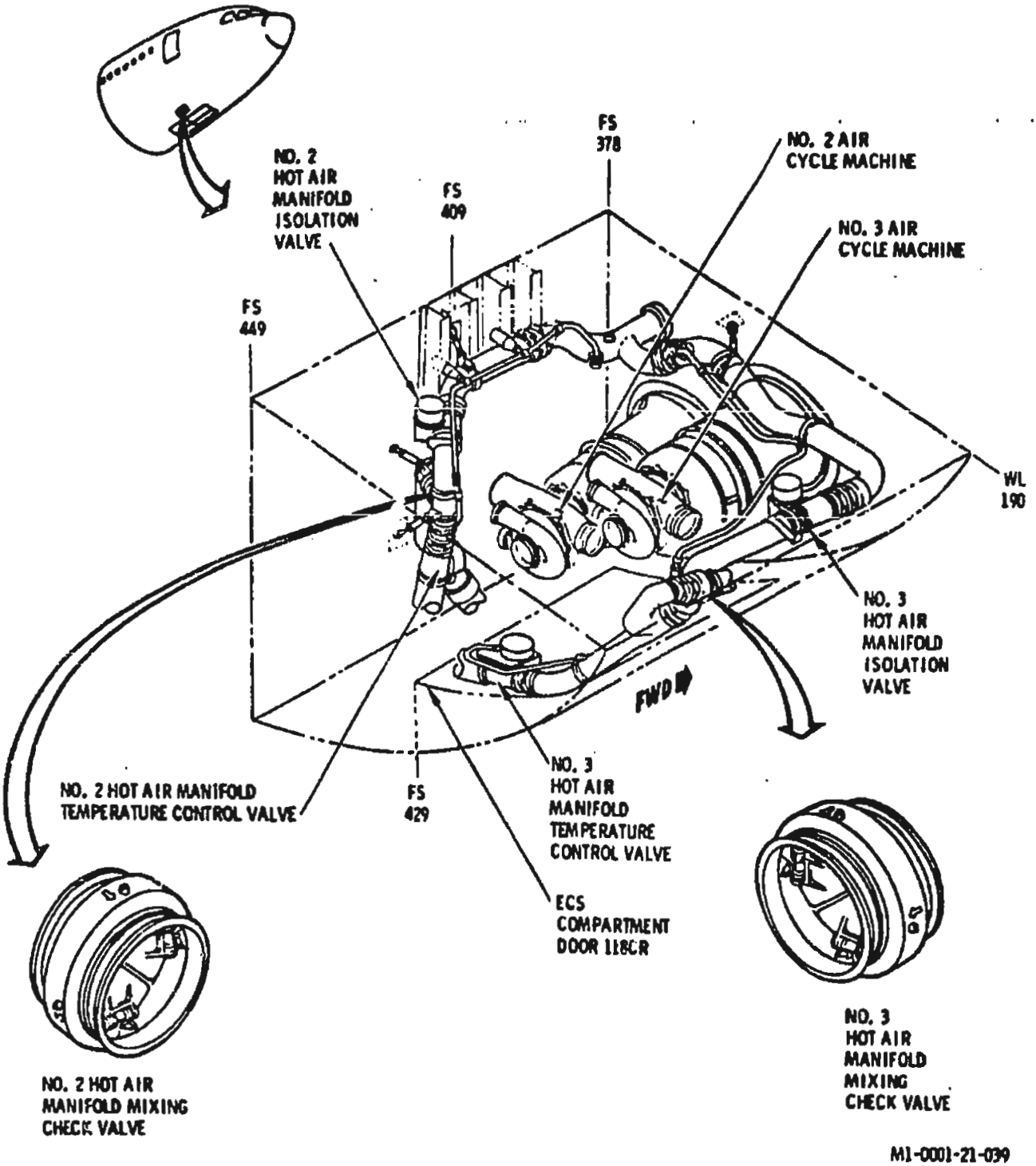
R (1) Verify that all tags installed in Steps 4A(1) and (2)
R are in place.



MA 3911
M1-0100-21-306

Hot Air Manifold Mixing Check Valve - Removal and Installation
Figure 401

EFFECTIVITY: 001-019 WITHOUT SB21-077


NO. 2 HOT AIR MANIFOLD ISOLATION VALVE
FS 409
FS 378
NO. 2 AIR CYCLE MACHINE
NO. 3 AIR CYCLE MACHINE
FS 449
WL 190
NO. 3 HOT AIR MANIFOLD ISOLATION VALVE
FWD
NO. 2 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
FS 429
NO. 3 HOT AIR MANIFOLD TEMPERATURE CONTROL VALVE
ECS COMPARTMENT DOOR 118CR
NO. 2 HOT AIR MANIFOLD MIXING CHECK VALVE
NO. 3 HOT AIR MANIFOLD MIXING CHECK VALVE
M1-0001-21-039

Hot Air Manifold Mixing Check Valve - Removal and Installation
Figure 401

EFFECTIVITY: 001-019 WITH SB21-077

R WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH
R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT
R IN LUNG, SKIN OR EYE IRRITATION.

R (2) Remove protective caps and clean duct and valve flanges
R and flexible swaged coupling components with solvent.
R Inspect for damage and replace any damaged component.

R (3) Lubricate flexible swaged coupling components (2
R O-rings, 2 washers, 1 two-piece retainer, and threads
R of body and nut). Wipe all lubricant from wrenching
R surfaces of body and nut.

R (4) Check direction of flow arrows on body of valve and
R install the coupling nut, one washer, and one O-ring on
R discharge end of valve. Slide washer and O-ring into
R coupling nut.

R (5) Verify single T-bolt V-band coupling is on duct for
R connection of valve inlet.

R (6) Install coupling body, one washer, and one O-ring onto duct for connection of valve discharge. Slide washer and O-ring into coupling body.

R (7) On aircraft 001-019 without SB21-077,
slide valve into position between duct ends. The flow arrows on No. 2 valve must point upward toward the hot air manifold and the arrows on No. 3 valve must point forward toward the hot air manifold.

R (7) On aircraft 001-019 with SB21-077,
slide valve into position between duct ends. The flow arrows on No. 2 valve must point aft and outboard toward the hot air manifold and the arrows on No. 3 valve must point aft toward the hot air manifold.

R (8) Install two retainer halves over valve and duct flanges
R at discharge end of valve.

R (9) Align valve and duct so retainer is fully closed and
R mate flexible swaged coupling components (Ref.
R 20-21-01) at discharge end of valve. Do not tighten
R coupling.

R (10) Install and torque single T-bolt V-band coupling (Ref.
R 20-36-01) at inlet end of valve.

R (11) Torque and lockwire flexible swaged coupling (Ref.
R 20-21-01) at discharge end of valve.

R (12) Remove all tags installed in Step 4A(1) and 2.

R (13) Turn on air conditioning system (Ref. 21-00-00).

R (14) Operate air conditioning system to vary usage of trim
R air from minimum to maximum with trim air at minimum
R temperature. Inspect valve installation for leaks and
R check system operation to verify valve is opening.

R (15) Turn off air conditioning system.

R (16) Close ECS compartment access door 118CR.

HOT AIR MANIFOLD MIXING CHECK VALVE - REMOVAL AND INSTALLATION

1. General

The two hot air manifold mixing check valves are installed in the right environmental control system (ECS) compartment, zone 118. They are in ducts taking partially cooled primary heat
R exchanger discharge air from the No. 2 and 3 air cycle systems. The No. 2 system mixing check valve is inboard of the No. 2 air cycle machine (ACM), near the compartment inboard bulkhead.

On aircraft 020-030 without SB21-077, the No. 3 system mixing check valve is outboard and slightly forward of the No. 3 ACM (Ref. Fig. 401).

On aircraft 020-030 with SB21-077 and 031-999, the No. 3 system mixing check valve is outboard and slightly aft of the No. 3 air cycle machine (ACM) near the compartment ceiling (Ref. Fig. 401).

2. Equipment and Materials

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps

3. Referenced Procedures

R	06-40-00	Exterior Access Doors
	20-36-01	Single T-bolt V-band Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers ENGINE BLEED
R CONTROL panel and APU CONTROL panel to prevent system
R operation until completion of procedure.

R (2) Tag the three high pressure ground air connections to
R prevent system operation until completion of procedure.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (3) Open ECS compartment access door 118CR (Ref. 06-40-00).

R (4) In ECS compartment, locate applicable mixing check valve (Ref. Fig. 401).

NOTE: On aircraft 020-030 without SB21-077, the discharge end of the No. 2 valve is up, and the discharge end of the No. 3 valve is forward.

NOTE: On aircraft 020-030 with SB21-077 and 031-999, the discharge end of the No. 2 valve is aft and outboard while the discharge end of the No. 3 valve is aft.

R (5) Loosen the inner clamp, adjacent to the valve, push the
R valve back until it gets free from the duct (Ref. Fig.
R 401).

R (6) Disconnect single T-bolt V-band coupling at inlet end
R of valve (Ref. 20-36-01) and slide coupling back onto
R duct.

R (7) Remove valve by sliding from between ends of ducts.

R (8) Install protective caps on exposed ends of ducts and valve.

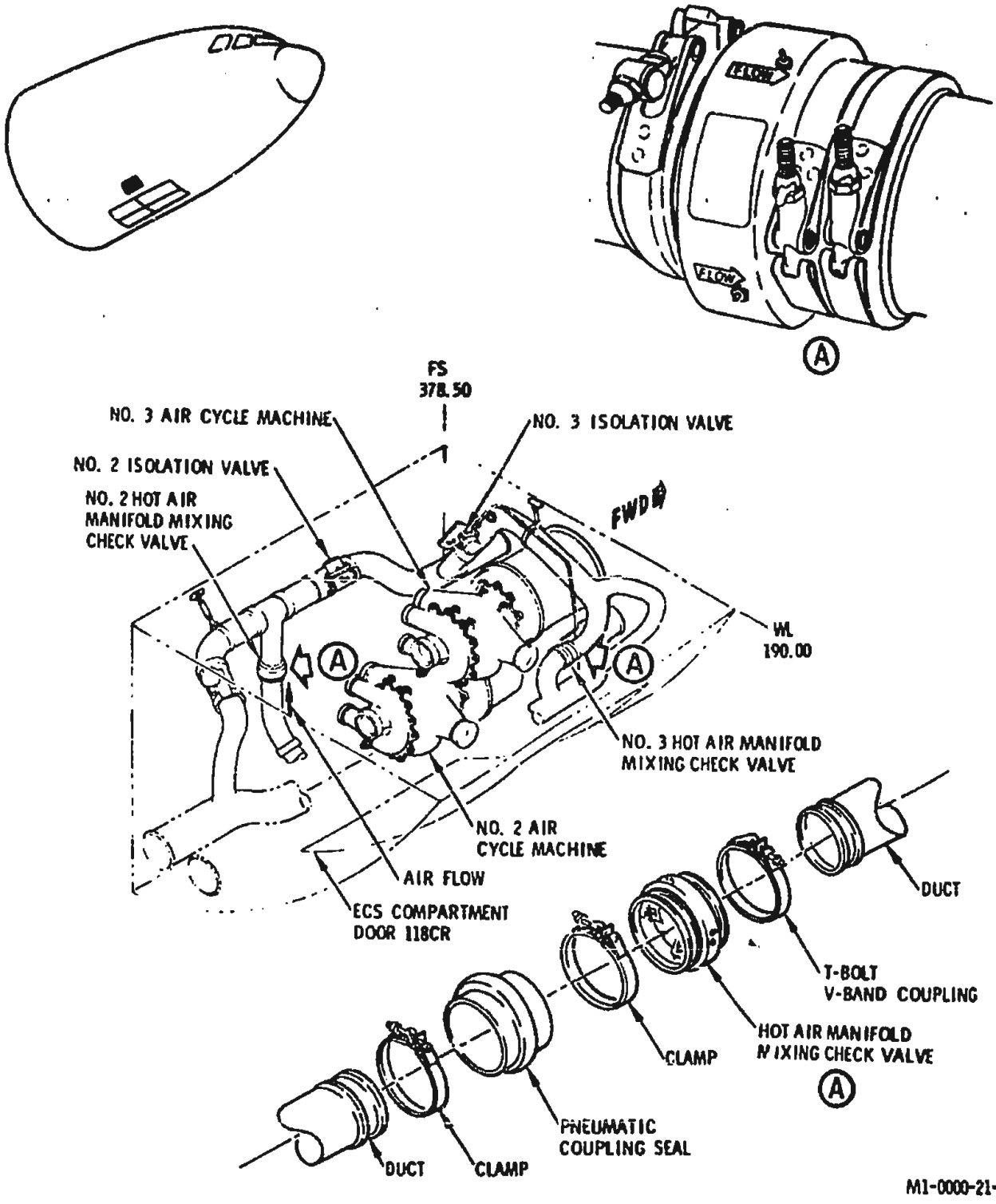
B. Installation

R (1) Verify that all tags installed in Steps 4A(1) and (2)
R are in place.

R WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN
R AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG,
R SKIN OR EYE IRRITATION.

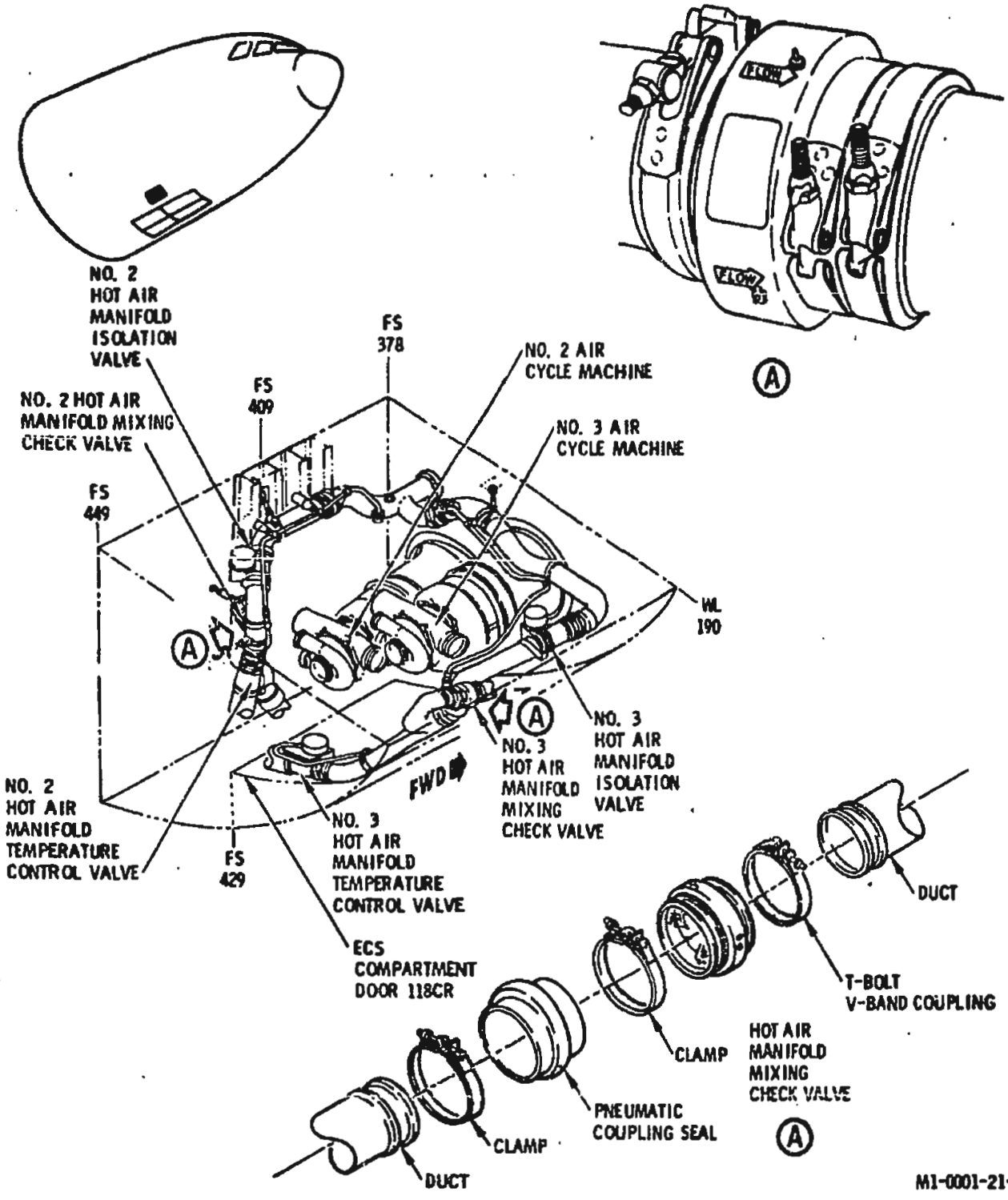
R (2) Remove protective caps and clean duct and valve flanges
R with M.E.K. or equivalent solvent. Inspect for damage
R and replace any damaged component.

R (3) Lubricate coupling components with non hardening
R silicon lubricant, Viscasil 10000 or equivalent.



CR Hot Air Manifold Mixing Check Valve - Removal and Installation
CR Figure 401

EFFECTIVITY: 020-030 WITHOUT SB21-077



R Hot Air Manifold Mixing Check Valve - Removal and Installation
R Figure 401

EFFECTIVITY: 020-030 WITH SB21-077, AND 031-999

R (4) Check direction of flow arrows on body of valve, engage
R the valve with the duct, and tighten the clamp on
R discharge end of valve.

R (5) Verify single T-bolt V-band coupling is on duct for connection of valve inlet.

R (6) On aircraft 020-030 without SB21-077, slide valve into position between duct ends. The flow arrows on No. 2 valve must point upward toward the hot air manifold and the arrows on No. 3 valve must point forward toward the hot air manifold.

R (6) On aircraft 020-030 with SB21-077 and 031-999, slide valve into position between duct ends. The flow arrows on No. 2 valve must point aft and outboard toward the hot air manifold and the arrows on No. 3 valve must point aft toward the hot air manifold.

R (7) Install and torque single T-bolt V-band coupling (Ref.
R 20-36-01) at inlet end of valve.

R (8) Remove all tags installed in Step 4A(1) and (2).

R (9) Turn on air conditioning system (Ref. 21-00-00).

R (10) Operate air conditioning system to vary usage of trim
R air from minimum to maximum with trim air at minimum
R temperature. Inspect valve installation for leaks and
R check system operation to verify valve is opening.

R (11) Turn off air conditioning system.

R (12) Close ECS compartment access door 118CR.

HOT AIR MANIFOLD DISCHARGE CHECK VALVE - REMOVAL AND INSTALLATION

1. General

R The hot air manifold discharge check valve is installed in
R Forward Electronic Service Center (FESC) in the duct just
R forward of the compartment aft bulkhead on the right side, to
R bring hot air to the zone trim system.

2. Equipment and Materials

O-rings (4), MS9068-346, or equivalent

Lubricant, Non-hardening Silicon Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

20-21-01 Flexible Swaged Coupling - Removal and Installation

21-00-00 Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) ENGINE
R BLEED AIR AND APU CONTROL PANELS AND THREE HIGH
R PRESSURE GROUND AIR CONNECTIONS MUST BE TAGGED TO
R PREVENT SYSTEM OPERATION UNTIL COMPLETION OF
R PROCEDURE.

R (1) Gain access to FESC.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (2) In aft right portion of FESC, where duct comes through bulkhead, remove insulation blanket(s) as necessary for access to valve installation.

(3) Cut lockwire and disconnect flexible swaged couplings on each end of the check valve (Ref. 20-21-01), one at a time. Use two strap wrenches if necessary.

(4) Slide coupling nuts, washers, and O-rings back onto body of valve (cut and discard O-rings if necessary).

(5) Slide coupling bodies, washers, and O-rings back onto ducts forward and aft of valve (cut and discard O-rings if necessary).

(6) Remove retainers from over duct and valve flanges at both ends of valve.

(7) Remove valve by sliding from between duct ends.

(8) Remove flexible swaged coupling components from both ducts and from valve and discard O-rings.

(9) Install protective caps on exposed ends of ducts and valve.

B. Installation

R (1) Verify that tags previously installed on FE/SO ENGINE BLEED air and APU CONTROL panels and the three high-pressure ground air connections are in place.

R WARNING: USE MEK SOLVENT IN WELL VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

R (2) Remove protective caps and clean duct and valve flanges and flexible swaged coupling components with MEK solvent. Inspect for damage and replace any damaged component.

R (3) Lubricate flexible swaged coupling components (4 O-rings, 4 washers, 2 two-piece retainers, and threads of 2 bodies and 2 nuts). Wipe all lubricant from wrenching surfaces of coupling bodies and nuts.

R (4) Install one coupling nut, one washer, and one O-ring on each end of valve. Slide washers and O-rings into coupling nuts.

R (5) Install one coupling body, one washer, and one O-ring on end of duct coming through bulkhead. Slide washer and O-ring into coupling body.

(6) Install one coupling body, one washer, and one O-ring on end of duct going to zone trim manifold. Slide washer and O-ring into coupling body.

(7) Check direction of flow arrows on body of valve and slide valve into position between duct ends with flow arrows pointing forward.

(8) Install two retainer halves over valve and duct flanges at aft end of valve.

(9) Align valve with duct so retainer is fully closed and mate flexible coupling components (Ref. 20-21-01) at aft end of valve. Do not tighten coupling.

(10) Install two retainer halves over valve and duct flanges at forward end of valve.

(11) Align valve and duct so retainer is fully closed and mate flexible swaged coupling components (Ref. 20-21-01) at forward end of valve. Do not tighten coupling.

R (12) Adjust valve and duct positions for minimum misalignment, then tighten and lockwire both flexible swaged couplings (Ref. 20-21-01).

(13) Remove WARNING tags installed in Paragraph 4A.

(14) Turn on air conditioning system (Ref. 21-00-00).

(15) Operate air conditioning system to vary usage of trim air from minimum to maximum. Inspect valve installation for leaks and check system operation to verify valve is opening.

(16) Turn off air conditioning system (Ref. 21-00-00).

(17) Install insulation blanket(s) removed in Step 4A(2).

HOT AIR MANIFOLD ISOLATION VALVE - MAINTENANCE PRACTICES

1. General

Both hot air manifold isolation valves are in the right environmental control system (ECS) compartment, zone 118 (Ref. Fig. 201). The No. 2 system valve is above and inboard of the
R No. 2 air cycle machine (ACM). The No. 3 valve is above the No.
R 3 ACM. The No. 3 ACM inlet shell must be moved forward to gain access to deactivate either valve.

R 2. Normal Deactivation

R NOTE: Normal deactivation procedure may be used if inoperative
R valve(s) position can be verified from the flight
R station. If unable to determine valve(s) position from
R the flight station, it is recommended that the alternate
R deactivation procedure be used.

R A. On Flight Engineer/Second Officers CABIN TEMP CONTROL panel,
R zone 215, unlatch inoperative ISLN VALVE switchlight(s) and
R placard applicable ISLN VALVE switchlight(s) ISLN VALVE
R INOP.

R B. On Flight Engineer/Second Officers aft circuit breaker panel
R CB3, zone 215, open and collar applicable circuit breaker
R HOT AIR MANF - ISLN - NO. 2 (W7) or NO. 3 (W8).

R C. If inoperative isolation valve(s) are closed; on Flight
R Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215,
R unlatch associated Hot Manifold Temperature Control Valve
R HOT AIR switchlight(s). Placard applicable HOT AIR
R switchlight(s) DO NOT OP.

R D. Make appropriate entry in aircraft log book.

R 3. Alternate Deactivation

R NOTE: It is recommended that the alternate deactivation
R procedure be used if unable to determine valve(s)
R position from the flight station.

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

A. On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and collar applicable circuit breaker HOT AIR MANF - ISLN - NO. 2 (W7) or NO. 3 (W8).

B. Open environmental control system compartment door 118CR.

C. Remove quick-disconnect pin from NO. 3 ACM inlet shell retainer (Ref. Fig. 201), and slide shell as far forward as possible.

D. Remove manual position lockpin from hole in valve.

E. Use one-half-inch wrench to close valve (counterclockwise rotation). Hold valve closed and insert long end of manual position lockpin into hole on valve.

F. Use wrench to verify valve is locked in closed position.

R G. Torque lockpin 20 to 30 lb in.

H. Slide inlet shell aft, rotating as necessary to align retainer and lugs on ACM.

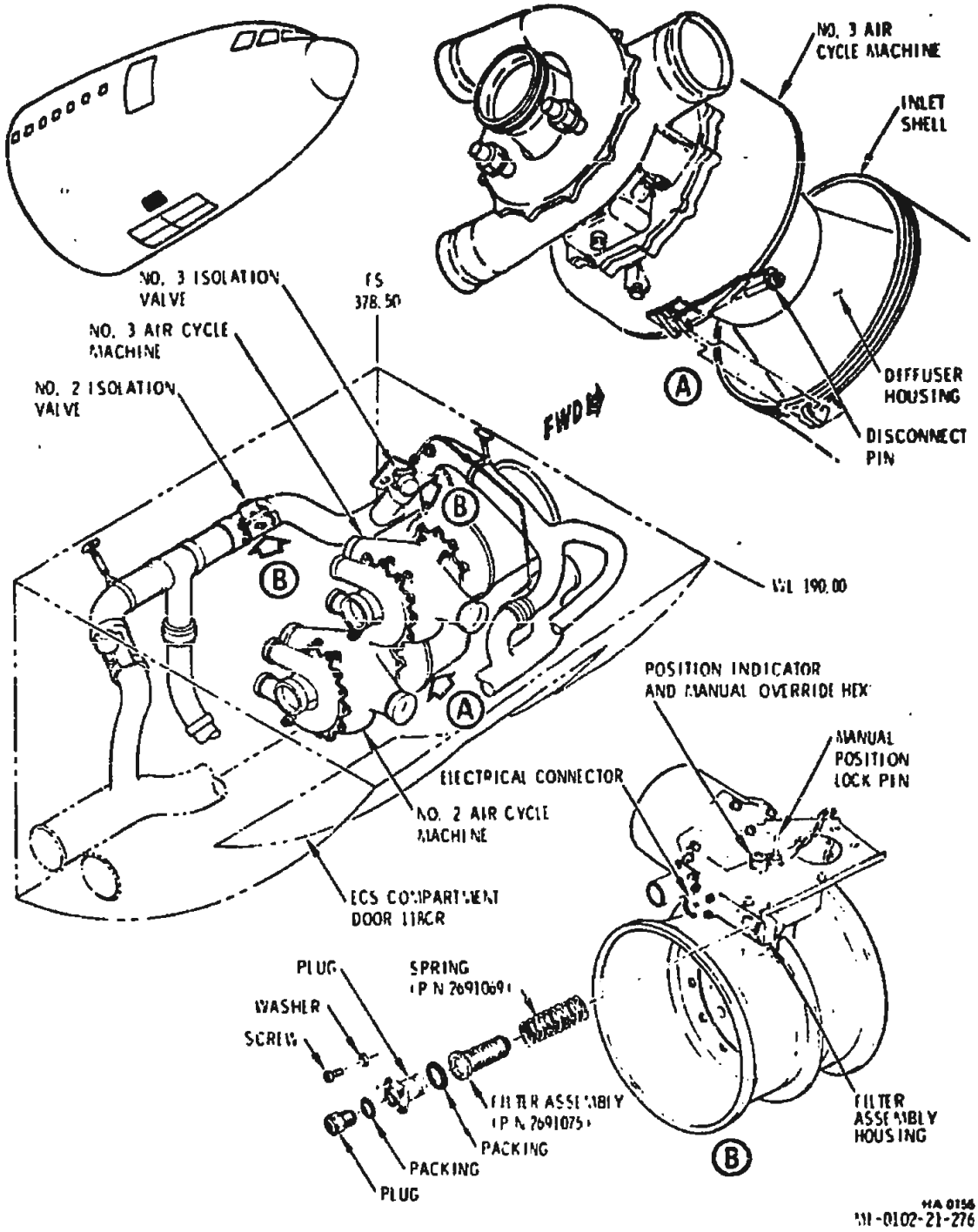
I. Install quick-disconnect pin.

J. Close access door.

K. On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard applicable ISLN VALVE INOPERATIVE.

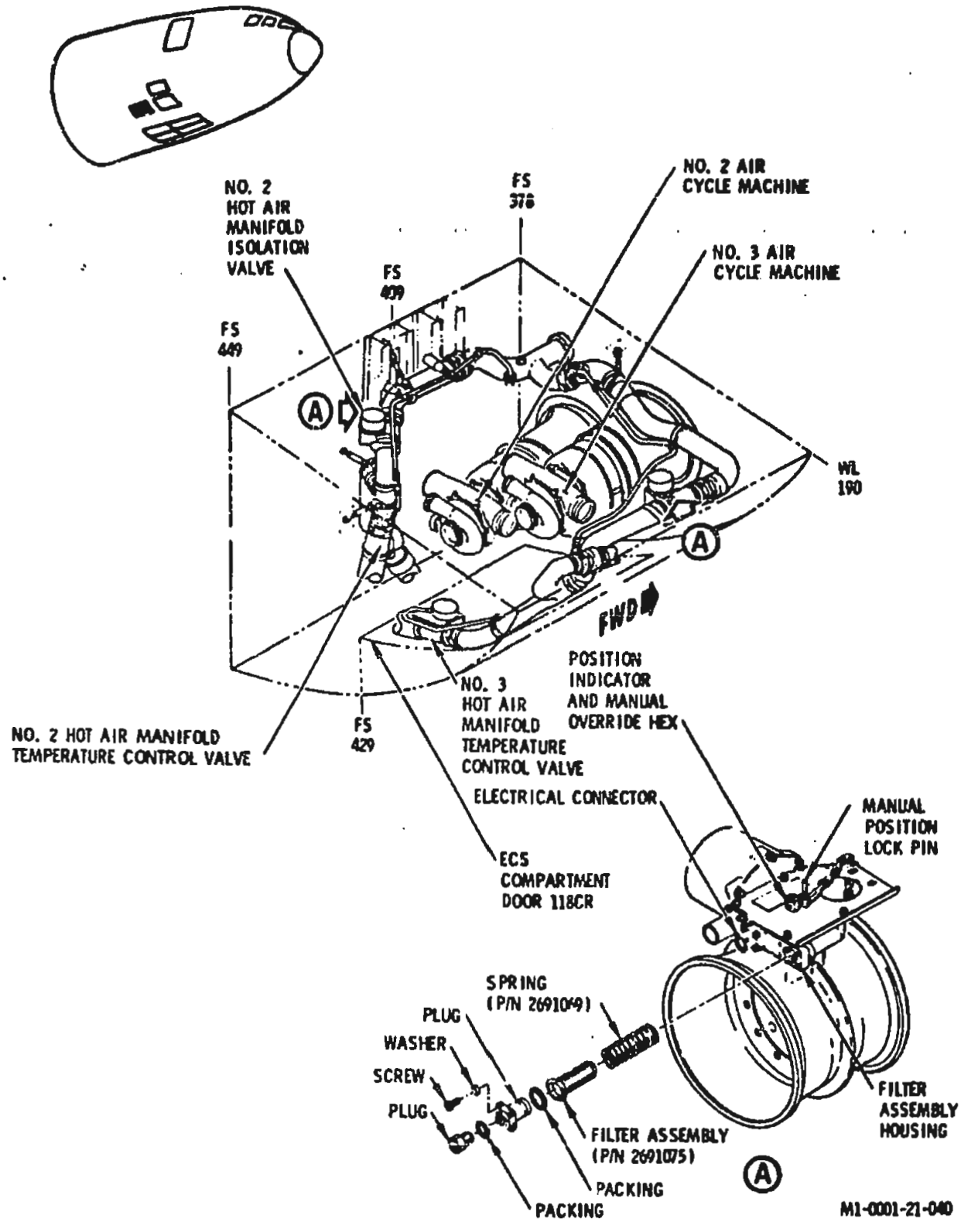
L. Remove tags installed in Step 2.

M. Make appropriate entry in aircraft log book.



R Hot Air Manifold Isolation Valve - Deactivation
R Figure 201

R EFFECTIVITY: 001-023 WITHOUT SB21-077



R Hot Air Manifold Isolation Valve - Deactivation
R Figure 201

R EFFECTIVITY: 001-023 WITH SB21-077 AND 024-999

HOT AIR MANIFOLD ISOLATION VALVE - REMOVAL AND INSTALLATION

1. General

The two hot air manifold isolation valves are installed in the right environmental control system (ECS) compartment, zone 118, in ducting taking hot air from the No. 2 and 3 air cycle packs through the hot air manifold temperature control valves. The No. 2 system isolation valve is above and inboard of the No. 2 air cycle machine (ACM) and the No. 3 system isolation valve is above and inboard of the No. 3 ACM. The No. 3 ACM inlet shell and diffuser housing must be slid forward, into the heat exchanger area, to provide space for access to the hot air manifold isolation valves.

C The hot air manifold isolation valve is open during all normal
C operation. Complete deactivation of the valve should seldom be
C necessary. If the valve fails in the closed position, it is in
C the deactivated position and no action is required.

2. Equipment and Materials

Hot Air Manifold Isolation Valve

R Pneumatic Coupling Seals

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Valve Air Filter

Filter (Parker Hannifin P/N 2691075)

Lockwire, MS 20995N20 or equivalent

Grease, Dow Corning NO. 33 (or equivalent)

3. Referenced Procedures

R	06-40-00	Exterior Access Doors and Panels Zone 100
	20-21-01	Flexible Swaged Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices
	21-51-07	Air Cycle Machine - Removal and Installation
	24-00-00	Electrical Power - Maintenance Practices

4. Removal/Installation - Hot Air Manifold Isolation Valve

A. Removal

R (1) Tag Flight Engineer/Second Officers, ENGINE BLEED
R CONTROL panel and APU CONTROL panel, to prevent system
R operation until completion of procedure.

R (2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breakers:

HOT AIR MANF - IND (W5) (either valve)

HOT AIR MANF - ISLN - NO. 2 (W7) or NO. 3 (W8)

R (3) Tag the three high-pressure ground air connections to
R prevent system operation until completion of procedure.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (4) Open ECS compartment access door 118CR (Ref. 06-40-00).

R (5) In ECS compartment, move No. 3 ACM inlet shell and diffuser housing forward, into heat exchanger area (Ref. 21-51-07) for access to valve (Ref. Fig. 401).

NOTE: Increased access room may be obtained by
R removing the four rivets attaching quick
R disconnect fitting to bottom of the ACM inlet
R shell. With fitting removed, inlet shell may be
R slid completely into heat exchanger inlet
R bellmouth. Reattach fitting to inlet shell with
R drilled head bolts and nuts, and lockwire bolt
R heads inside the inlet shell after valve
R installation.

(6) Disconnect electrical cable connector from valve receptacle, install protective caps on connector and receptacle, and stow cable to prevent damage.

(7) Cut lockwire and disconnect flexible swaged couplings (Ref. 20-21-01) at both ends of valve. Use two strap wrenches on coupling if necessary.

(8) Slide coupling nuts, washers, and pneumatic coupling seals back onto body of valve (cut and discard pneumatic coupling seals if necessary).

(9) Slide coupling bodies, washers, and pneumatic coupling seals back onto ducts at each end of valve (cut and discard pneumatic coupling seals if necessary).

(10) Remove retainers from over valve and duct flanges at both ends of valve.

(11) Remove screws attaching valve bracket to support bracket.

(12) Remove valve by sliding from between ends of ducts.

(13) Remove flexible swaged coupling components from ducts and valve and discard pneumatic coupling seals.

(14) Install protective caps on exposed ends of ducts and valve.

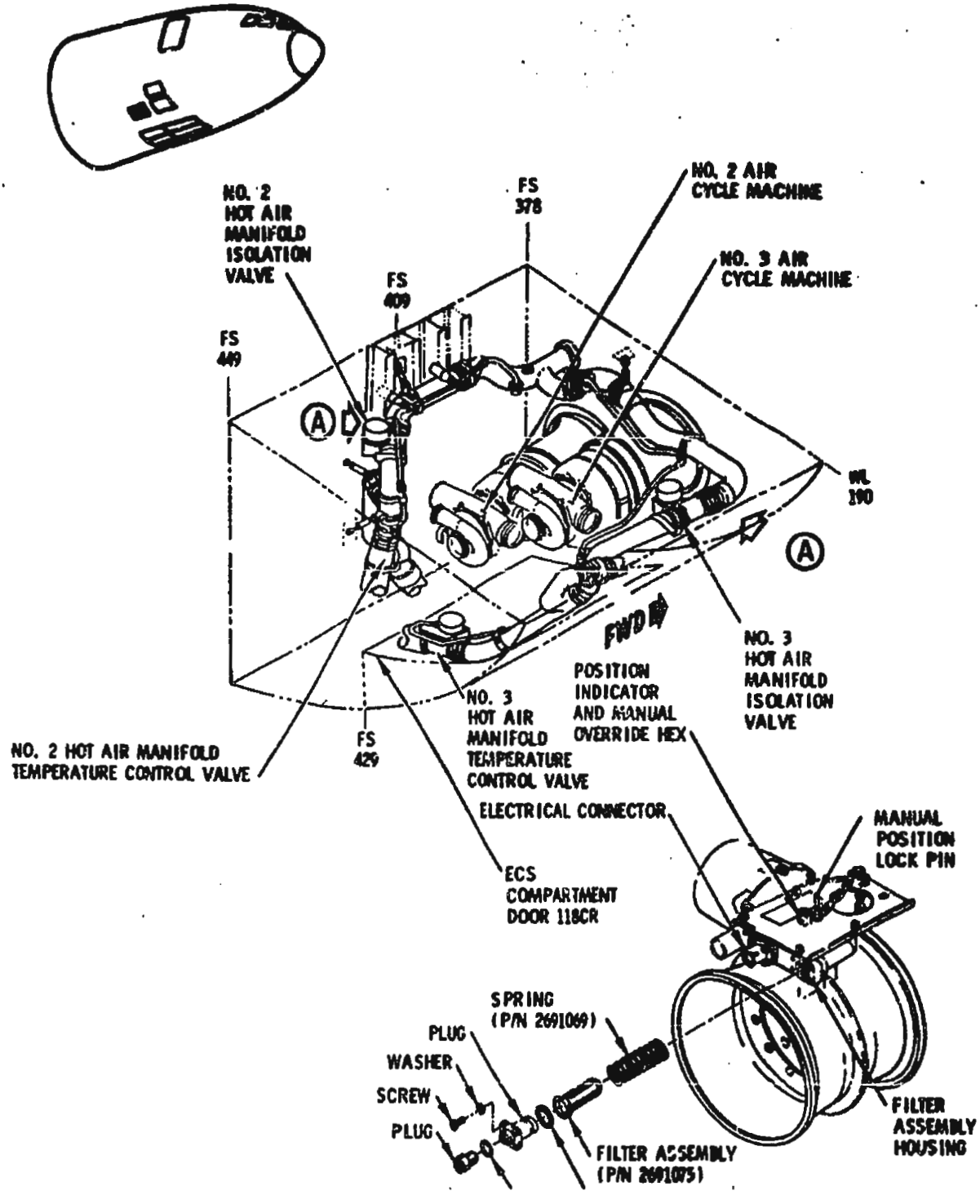
B. Installation

(1) Verify that all tags installed in Steps 4A(1), (2) and (3) are in place.

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

(2) Remove protective caps and clean duct and valve flanges and flexible swaged coupling components with M.E.K. or equivalent solvent. Inspect for damage and replace any damaged component.

(3) Lubricate flexible swaged coupling components with non-hardening silicone lubricant, Viscasil 10,000 or equivalent (4 pneumatic coupling seals, 4 washers, 2 two-piece retainers, and threads of 2 bodies and 2 nuts). Wipe all lubricant from wrenching surfaces of coupling bodies and nuts.



R Hot Air Manifold Isolation Valve - Removal and Installation
R Figure 401

(4) Install one coupling nut, one washer, and one pneumatic coupling seal on each end of valve. Slide washers and pneumatic coupling seals into coupling nuts.

(5) Install one coupling body, one washer, and one pneumatic coupling seal on each exposed duct end. Slide washers and pneumatic coupling seals into coupling bodies.

(6) Slide valve into position between duct ends, with valve bracket positioned to connect to support bracket.

(7) Install two retainer halves over valve and duct flanges at one end of valve.

(8) Align valve and duct so retainer is fully closed and mate flexible coupling components (Ref. 20-21-01) at this end of valve. Do not tighten coupling.

(9) Install two retainer halves over valve and duct flanges at other end of valve.

(10) Align valve and duct so retainer is fully closed and mate flexible coupling components (Ref. 20-21-01) at that end of valve. Do not tighten coupling.

(11) Install screws attaching valve bracket to support bracket.

(12) Adjust duct positions for minimum misalignment and torque, and secure both flexible swaged couplings using lockwire, Fed Spec QQ-W-390, 0.32-inch diameter or equivalent, (Ref. 20-21-01).

(13) Remove protective caps and connect electrical cable connector to valve receptacle.

(14) Install No. 3 ACM diffuser housing and inlet shell, (Ref. 21-51-07).

(15) Remove all tags and close circuit breakers opened in Steps 4A(1), (2) and (3).

(16) Turn on electrical power (Ref. 24-00-00).

(17) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, release applicable ISLN VALVE switchlight to the close (out) position. The flow bar in the switchlight must be off.

WARNING: DO NOT OPERATE AIR CONDITIONING SYSTEM BEFORE VERIFYING PROPER INSTALLATION OF NO. 2 and NO. 3 ACM DIFFUSER HOUSINGS AND INLET SHELLS.

(18) Turn on air conditioning system (Ref. 21-00-00).

(19) Depress applicable ISLN VALVE switchlight to the open (latched in) position. Flowbar in switchlight must come on.

(20) In ECS compartment, check isolation valve installation for leaks and verify valve position indicator shows valve is open (Ref. Fig. 401).

(21) Release applicable ISLN VALVE switchlight to the close (out) position. Flowbar in switchlight must go off.

(22) Again check isolation valve installation for leaks and verify valve position indicator shows valve is closed.

(23) Turn off air conditioning system (Ref. 21-00-00).

(24) Turn off electrical power (Ref. 24-00-00).

(25) Close ECS compartment access door 118CR.

5. Removal/Installation - Valve Air Filter

A. Removal

(1) Tag Flight Engineer/Second Officers ENGINE BLEED CONTROL panel and APU CONTROL panel to prevent system operation until completion of procedure.

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breakers:

HOT AIR MANF - IND (W5) (either valve)

HOT AIR MANF - ISLN - NO. 2 (W7) or NO. 3 (W8)

(3) Tag the three high pressure ground air connections, to prevent system operation until completion of procedure.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(4) Open ECS compartment access door 118CR (Ref. 06-40-00).

(5) In ECS compartment, move No. 3 ACM inlet shell and diffuser housing forward, into heat exchanger area (Ref. 21-51-07) for access to valve (Ref. Fig. 401).

NOTE: Increased access room may be obtained by removing the four rivets attaching the quick disconnect fitting to the bottom of the ACM inlet shell. With the fitting removed the inlet shell may be slid completely into the heat exchanger inlet bellmouth. Reattach the fitting to the inlet shell with drilled head bolts and nuts and lockwire the bolt heads inside the inlet shell after valve installation.

(6) Remove lockwire between plug and connector.

(7) Remove screws, washers, nuts, plug (Parker Hannifin P/N 2691071) spring and filter (on earlier valves) or plug filter (Parker Hannifin P/N 2763397-101) (later valves) from housing and remove packing(s).

(8) Inspect packings and replace if damaged (Parker Hannifin P/N 26611058R015).

(9) Inspect Helical Compression spring. If damaged replace spring (Parker Hannifin P/N 2691069).

B. Installation

(1) Verify that all tags installed in Steps 5A(1), (2) and (3) are in place.

CAUTION: FILTER MUST BE INSTALLED WITH FLANGED END OUTBOARD.

(2) Install spring followed by filter with flanged end outboard into the valve housing (Ref. Fig. 401).

(3) Install packing (Parker Hannifin P/N 2661058R015) on plug.

(4) Apply Dow Corning No. 33 (or equivalent) grease to screws, washers and assemble through plug into housing and tighten to 10±1 pound inch using driver bit F80-0-1175-3 (or equivalent).

(5) Secure plug with 4 screws using lockwire No. MS 20995N20 per MS 33540.

(6) Remove all tags and close circuit breakers opened in Steps 5A(1), (2) and (3).

HOT AIR MANIFOLD ISOLATION VALVE - INSPECTION AND CHECK

1. General

Inspection of the pack No. 2 and 3 hot air manifold isolation valve filters should be made in accordance with airline time limits and maintenance standards. There is no check procedure required, other than visual check of the valve installation whenever area is open.

2. Equipment and Materials

Solvent, AMS3160B, or equivalent

Soft-bristle brush

Preformed Packing

3. Referenced Procedures

21-41-17 Hot Air Manifold Isolation Valve - Removal and Installation

4. Inspection/Check

A. Inspection

R (1) Tag Flight Engineer/Second Officers, ENGINE BLEED
R CONTROL panel and APU CONTROL panel to prevent system
R operation until completion of procedure.

R (2) Tag the three high pressure ground air connections, to
R prevent system operation until completion of procedure.

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R TEMPERATURE. PROTECTIVE GLOVES SHOULD BE USED
R WHEN REQUIRED.

R (3) Remove filter (Ref. 21-41-17, Paragraph 5).

R (4) Inspect filter element for clogged or dirty pores.

R WARNING: USE SOLVENT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN
R AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG,
R SKIN OR EYE IRRITATION.

R CAUTION: USE COMPRESSED AIR CAREFULLY TO PREVENT DAMAGE TO
R FINE-MESH SCREEN OF FILTER ELEMENT.

R (5) Clean dirty filter element by agitating in clean
R solvent AMS3160B or equivalent and brushing with
R soft-bristle brush. Dry filter element using dry,
R filtered, compressed air.

R (6) Inspect filter packing; replace if damaged.

R (7) Reinstall filter, (Ref. 21-41-17, Paragraph 5).

R (8) Close ECS compartment door.

R (9) Remove tags installed in Steps 4A(1) and (2).

HOT AIR MANIFOLD DUCT OVERTEMPERATURE SWITCH MAINTENANCE PRACTICES

1. General

Deactivation for an inoperative hot air manifold duct overtemperature switch is accomplished by deactivation of both hot air manifold temperature control valves.

2. Referenced Procedure

21-41-02 Hot Air Manifold Temperature Control Valve - Maintenance Practices

2. Maintenance Practices

A. Deactivation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION
R UNTIL COMPLETION OF PROCEDURE.

R RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Deactivate both hot air manifold temperature control valves (Ref. 21-41-02).

(2) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard both HOT AIR switchlights OVERTEMP SWITCH INOPERATIVE, VALVES DEACTIVATED.

(3) Make appropriate entry in aircraft log book.

HOT AIR MANIFOLD DUCT OVERTEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. General

The hot air manifold duct overtemperature switch is in the aft right portion of the forward electronic service center (FESC), zone 118. It is installed in the zone trim system supply air duct that runs diagonally upward and outboard from the compartment aft bulkhead to the duct supplying the five zone trim valves.

2. Equipment and Material

O-ring, MS9385-08, or equivalent

Protective plug and caps

3. Referenced Procedure

R 06-40-00 Exterior Access Doors and Panels Zone 100

21-00-00 Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers, ENGINE BLEED
R CONTROL panel and APU CONTROL panel, to prevent system
R operation until completion of procedure.

R (2) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breaker HOT
R AIR MANF - TEMP CONT (W6).

R (3) Tag the three high pressure ground air connections, to
R prevent system operation until completion of procedure.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (4) Open FESC access door 112AB (Ref. 06-40-00).

R (5) In aft right portion of FESC, disconnect electrical cable connector from overtemperature switch receptacle.

R R (6) Install protective caps on cable connector and switch receptacle.

R R (7) Unscrew overtemperature switch from duct boss, remove and discard O-ring.

R (8) Install protective plug in duct boss.

B. Installation

R R (1) Verify that all tags installed in Steps 4A(1), (2) and (3) are in place.

(2) Install new O-ring on overtemperature switch.

(3) Remove protective plug from duct boss and install overtemperature switch with O-ring in boss.

(4) Remove protective caps and connect electrical cable connector to overtemperature switch receptacle.

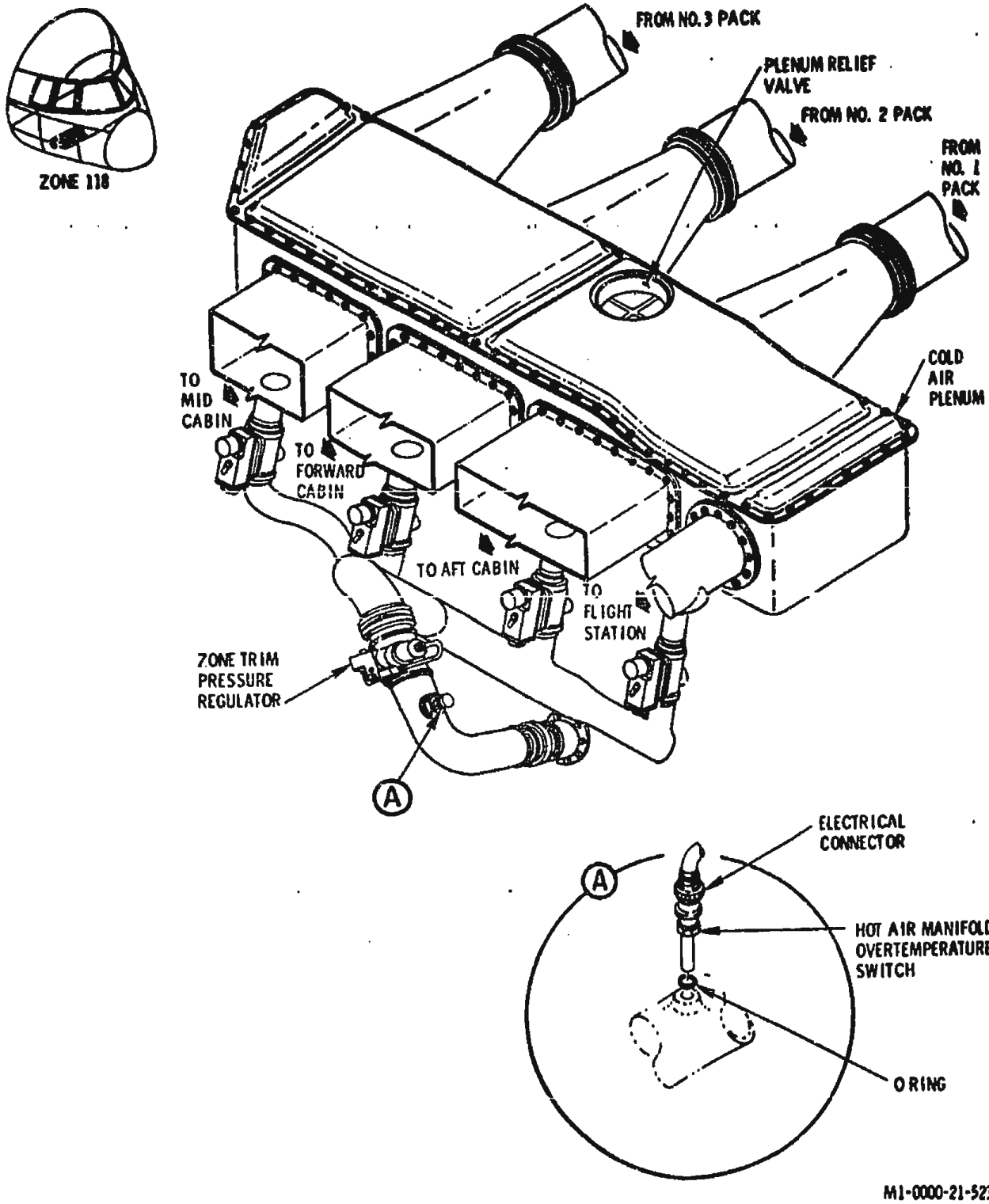
R R (5) Remove tags and close circuit breaker opened in Steps 4A(1), (2) and (3).

R (6) Turn on air conditioning system (Ref. 21-00-00).

R R R R (7) Operate air conditioning system to use zone trim system, varying usage of trim air from minimum to maximum. Check overtemperature switch installation for leaks.

R (8) Turn off air conditioning system (Ref. 21-00-00).

R (9) Close FESC access door 112AB.



R Hot Air Manifold Overtemperature Switch
R Removal/Installation
R Figure 401

R EFFECTIVITY: ALL
R
0018

R **FESC AREA OVERTEMPERATURE SWITCH - REMOVAL AND INSTALLATION**

R 1. General

R The FESC area overtemperature switch is located in the FESC on
R the aft right relay panel. It is installed above the relays to
R sense area overtemperature conditions.

R 2. Referenced Procedures

R 06-40-00 Exterior Access Doors and Panels, Zone 100

R 3. Removal/Installation

R A. Removal

R (1) On FE/SO aft circuit breaker panel CB3, zone 215, open
R and tag circuit breaker HOT AIR MANF ISLN NO. 3 (W8).

R (2) Open FESC access door 112AB (Ref. 06-40-00).

R (3) Remove screws and electrical leads from overtemp switch
R (Ref. Fig. 401).

R (4) Remove nuts, screws and overtemp switch from switch
R support.

R B. Installation

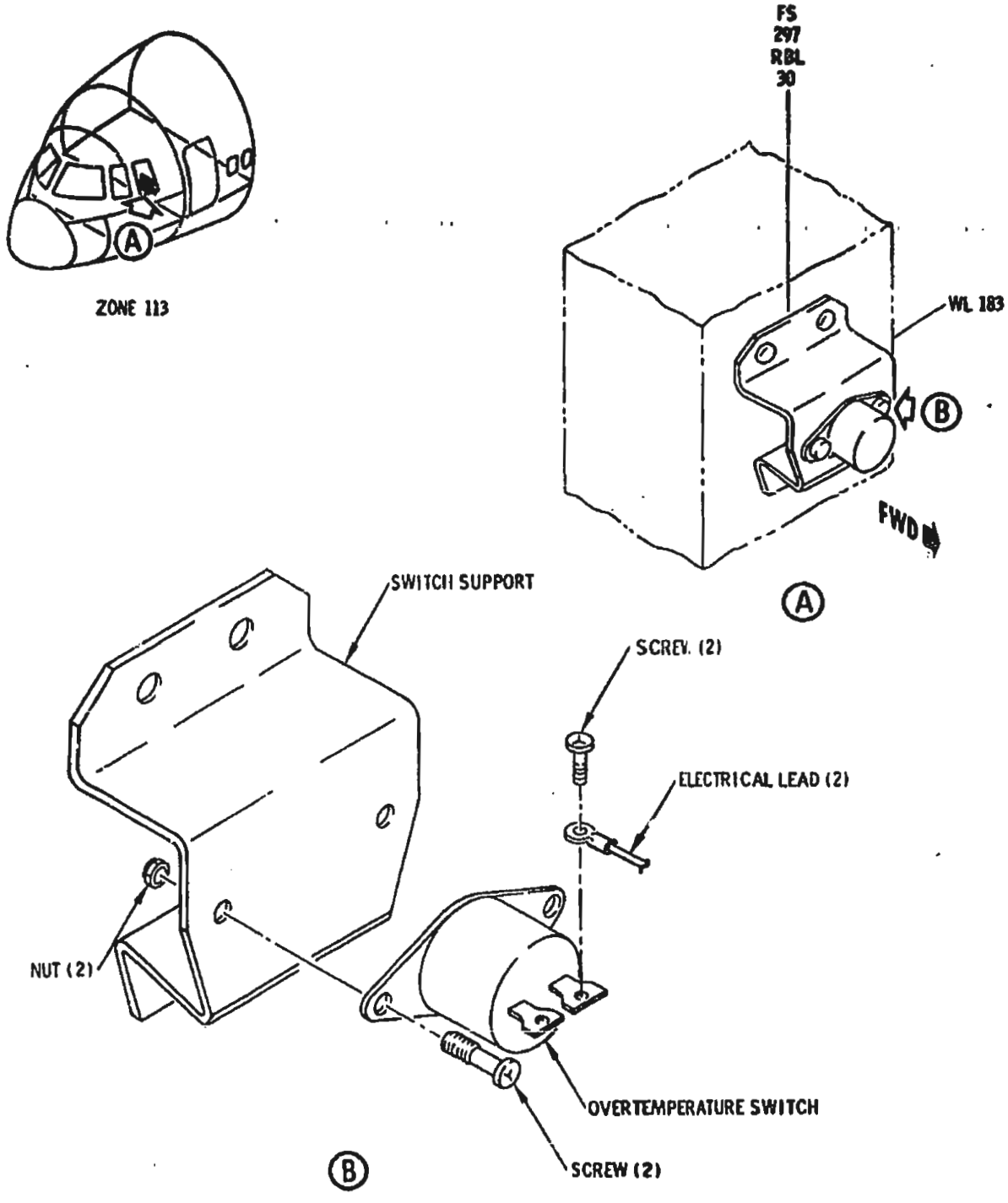
R (1) Verify circuit breaker opened in Step 3A(1) is still
R opened and tagged.

R (2) Install overtemp switch on switch support with screws
R and nuts (Ref. Fig. 401).

R (3) Install electrical leads on overtemp switch with
R screws.

R (4) Close access panel 112AB (Ref. 06-40-00).

R (5) Remove tag and close circuit breaker opened in Step
R 3A(1).



MI-0000-21-2477

R FESC Area Overtemperature Switch - Removal/Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

WALL HEAT SYSTEM - DESCRIPTION AND OPERATION

1. General

The wall heat system warms the cabin walls by convective downward movement of air taken from just below the overhead storage modules moving between the interior walls and the insulated fuselage skins, to floor level. The air reenters the cabin just above the cabin exhaust grilles to exhaust through that system. For more information on the cabin trim panels refer to 25-26-00, Passenger Compartment Trim and Insulation.

C FLOOR HEAT SYSTEM - DESCRIPTION AND OPERATION

C 1. GENERAL

R NOTE: On aircraft with SB21-228 incorporated,
R the floor heat system is deactivated.

C Cabin floor heat system consists of heater element mounted to
C the underside of the floor panels above the wing box, main
C landing gear wheel wells, and hydraulic service center. Power
C to the heater element is controlled by the cabin floor heat
C controller located in the mid electrical service center.

C 2. CABIN FLOOR HEAT SYSTEM

C A. Description - The floor is maintained at a temperature of 80
C (±2) degrees F.

C The cabin floor heat system (Ref. Fig. 1) is used to
C maintain a comfortable temperature for the floor over the
C wing center section, the main wheel wells and the hydraulic
C service center. The system compensates the loss of heat
C through the cabin floor seat rails to unpressurized area
C below the floor. The cabin floor temperature is maintained
C at 80 degrees F (26.7 degrees C) with overheat lockout at
C 100 degrees F (37.8 degrees C). The system consists of:

C A cabin floor heat control box.

C Floor heater strips (one on each side of the seat
C tracks).

C Two overheat switches.

C On aircraft 001-025,
C two thermistors (connected only to the original control
C box DDC PN 11028), TWA P/N A02412-1.

C On aircraft 026-031,
C two temperature control switches (connected only to the
C redesigned control box LAC PN 1591950).

C (1) Cabin Floor Heat Controller

C The cabin floor heat controller is located on the aft
C bulkhead of the mid electrical service center. The
C controller regulates power to two three-phase heater
C loads and a single-phase heater load. The controller

C also provides protection against various external and
C internal failure modes.

C Controller TWA P/N A02412-1 (Stk Nbr. 271-3039) is used
C for aircraft 001-025.

C Controller, LCC P/N 1591950-103 (Stk Nbr. 271-3577) is
C used for aircraft 026-031.

C (2) Floor Heaters

C The floor heater elements are Inconel wire enclosed in
C a plastic sheet sandwich. The assembled heaters are
C cemented to the underside of the floor panels. Two of
C the panels each have an overheat switch cemented to the
C underside also. These overheat switches are preset to
C close at 100 degrees F (37.8 degrees C). Reference
C panel No. 251LB (18), and 261EB (40), reference Figure
C 1.

C On aircraft 001-025,
C there are also two thermistors in the system cemented
C to the underside of the same two floor panels. The
C thermistors work only in conjunction with the original
C floor heat controller TWA P/N A02412-1.

C On aircraft 026-031,
C there are also two temperature control switches in the
C system cemented to the underside of the two floor
C panels. Reference panel No. 251LB (18) and 261EB (40),
C reference Figure 1.

C B. Operation

C On aircraft 001-025,
C with original controller TWA P/N A02412-1 the cabin floor
C heat system is an automatic system. The system controls the
C amount of heat added to the floor panels to compensate for
C the loss due to restricted air circulation between the floor
C seat tracks and the wing center section, the main wheel
C wells, and the hydraulic service center.

C Overheat switches in the floor protects it from exceeding
C 100 degrees F (38 degrees C). Whenever the floor
C temperature reaches 100 degrees F (38 degrees C), the FLOOR
C HEAT FAIL light on the Fe/SO ECS MONITOR panel is
C illuminated and power is cut off.

C The system (Ref. Fig. 2) is turned on when the FLOOR HEAT
C switchlight on the ENGINE BLEED CONTROL panel, zone 215, is
C depressed (latched in). The energized switchlight completes
C the circuit for the remote circuit breaker (Ref. 24-20-00).

C When the circuit breaker closes, 115V ac, 400 Hz, three-phase is applied to the floor heat controller. Power passes through the normally closed contacts of the lockout relay. From the relay, power passes to three silicon control rectifiers (SCRs) that are a part of the three-phase current regulator. The current in one phase is detected by a current transformer and applied to a regulator-amplifier to control the SCRs. The single-phase regulator operates in the same manner from Phase A.

C On aircraft 001-025, with original controller TWA P/N A02412-1, fault protection for the controller consists of a no-load detector, a thermistor open and shorted detector, and a high-temperature and amplifier-malfunction detector. If any one of the above faults occurs, or if one of the external overheat switches closes, the lockout relay closes and removes the three-phase power from the SCRs, and the FLOOR HEAT switchlight FAIL legend comes on.

C When the switchlight is released, 28V dc is removed and the remote control circuit breaker opens.

C On aircraft 026-031, a simpler controller, LCC P/N 1591950-103, replaces the original unit. The new controller is a relay switching device controlled by thermal switches on the floor panels. Circuit breakers in the controller provide the circuit fault protection.

C The temperature of the floor panels is controlled by two 80° F temperature switches which cycle the controller on-off.

C Overheat protection is two 100° F switches located on the same two floor panels, numbers 251LB, (18) and 261EB, (40), reference Figure 1. In the event of a lockout, that might occur when operating on a hot day with the heat soaked cabin, the system may be reset by opening and closing the Floor Heat switchlight on the Engine Bleed Control panel after the floor temperature is below 95°F.

C The new controller, reference Figure 1, has circuit breakers installed which may require reset if a short exists in the floor heat panel or the aircraft wiring.

C 3. FLOOR HEAT SYSTEM MAINTENANCE

C The following three sections provide different approaches to check, test and trouble shoot the floor heat system. The first section is an alternate checkout to be accomplished with a special test box.

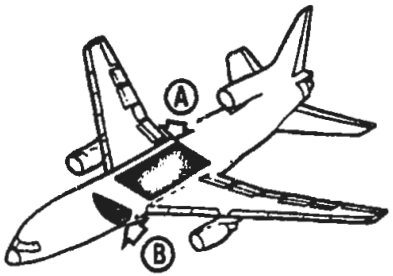
C The second section, Fault Isolation (Ref. MM-21-43-00,101), is a
C detail step by step. The third, adjustment and test (Ref.
C MM-21-43-00,501), provides operational checkout without test
C box.

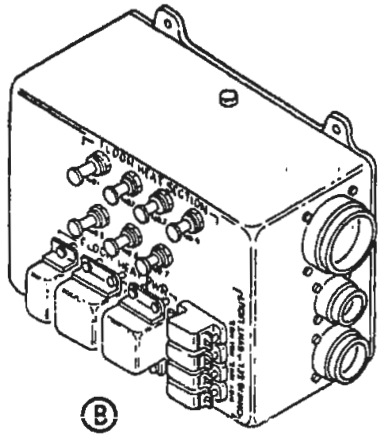
C A. ALTERNATE CABIN FLOOR HEAT SYSTEM CHECK OUT USING TEST BOX

C The floor heaters, control switches or thermistors, remote
C control circuit breaker, power supply and ship wiring can be
C checked out by using the portable test box, P/N
C 21-40-01-0029. If during this check additional information
C about the system is needed, refer to Adjustment and Test
C section, Page 501, or the Fault Isolation section, Page 101.

C To accomplish the checkout work from the cockpit to control
C C/B's and floor heat control switch and work in the MESC to
C obtain readings using the test box, copy reference Figure 3
C and the floor heat checkout sheet, reference Figure 4, and
C use as work instructions and data sheet.

C Make corrections as required. Refer to Troubleshooting
C (101-) and Adjustment/Test (501-).

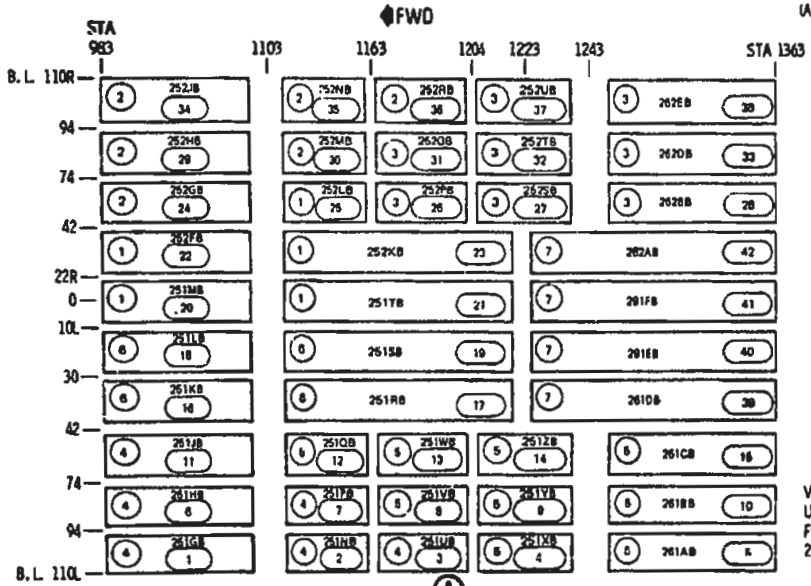




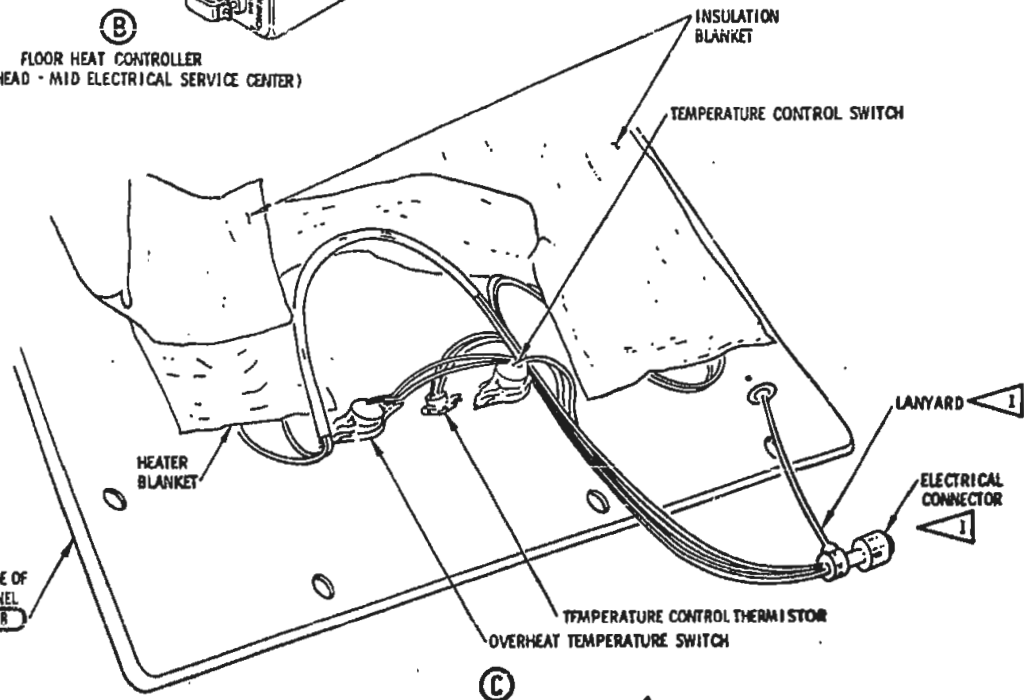
B
FLOOR HEAT CONTROLLER
(AFT BULKHEAD - MID ELECTRICAL SERVICE CENTER)

NOTE

1. TEMPERATURE CONTROL THERMISTOR TEMPERATURE CONTROL SWITCH AND OVERHEAT TEMPERATURE SWITCH NOT ON ALL FLOOR PANELS
- (X) CONTROLLING CIRCUIT BREAKER ON FLOOR HEAT CONTROLLER
- (XX) FLOOR HEAT PANEL REFERENCE NUMBERS
- 1 ON AIRCRAFT 015-031 ONLY (AIRCRAFT 001-014 WIRES GO TO TERMINAL MODULE)



CABIN FLOOR HEAT PANEL LAYOUT



C
TYPICAL CABIN FLOOR HEAT PANEL 1

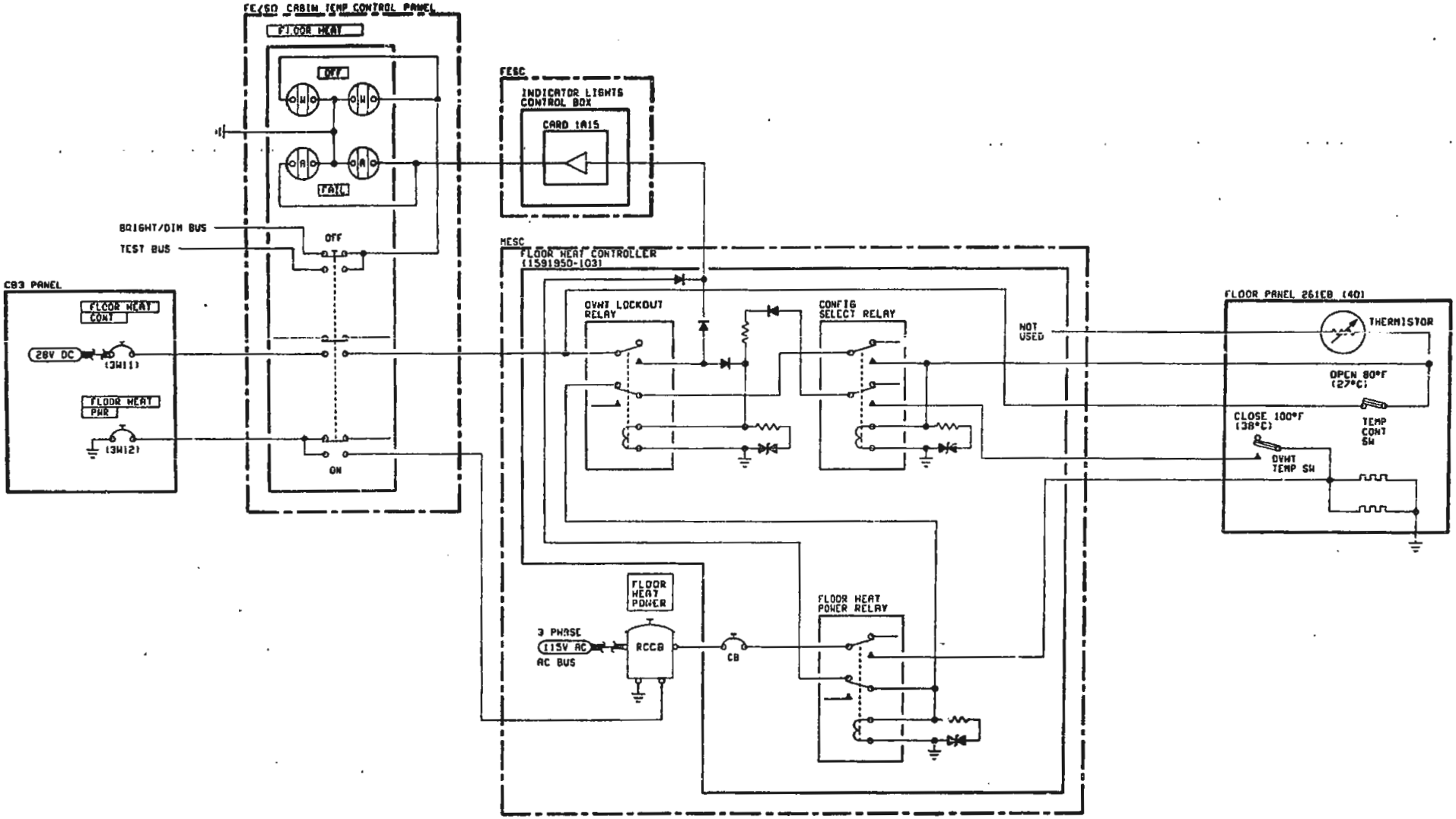
M1-0001-21-1677

CR
CR

Cabin Floor Heat System
Figure 1

EFFECTIVITY: 001-031

0058

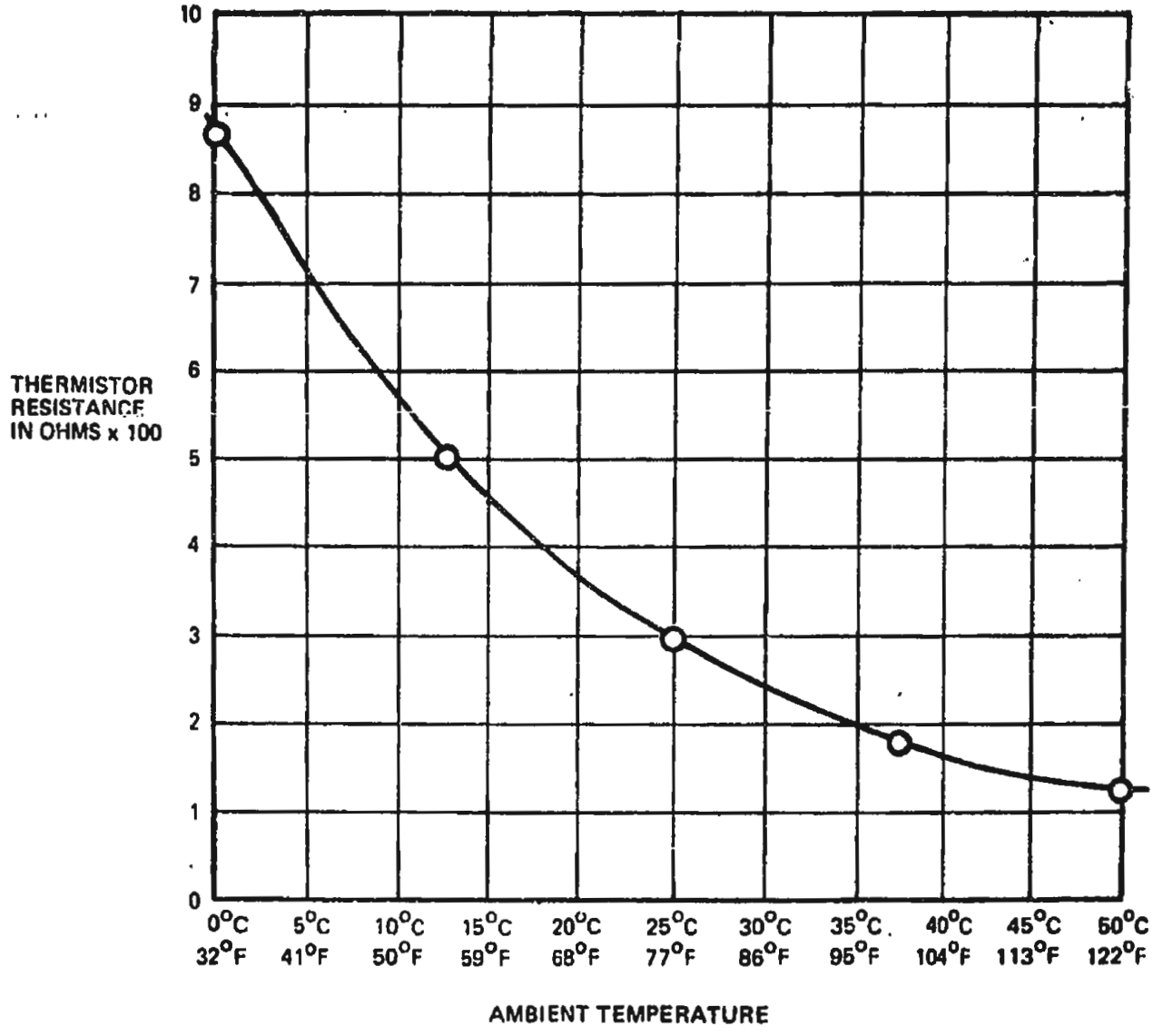


Simplified Schematic Cabin Floor Heat System
Figure 2

CR
CR

EFFECTIVITY: 001-031

005B



M1-0000-21-2165

CR Thermistor Resistance Vs Ambient Temperature
CR Figure 3

L1011 FLOOR HEAT CHECK OUT

AIRCRAFT NUMBER _____

_____ 1. PULL W11 AND W12 ON CB3.

_____ 2. REMOVE ALL CONNECTORS FROM FLOOR HEAT CONTROL BOX.

_____ 3. CONNECT REMOVED CONNECTORS TO FLOOR HEAT TEST BOX.

_____ 4. RESET W11 AND W12 ON CB3.

_____ 5. DEPRESS FLOOR HEAT SWITCH LIGHT.

_____ 6. OBSERVE THREE PHASE POWER AND DC CONTROL LIGHTS ON ☐ AΦ ☐ BΦ ☐ CΦ ☐ DC

_____ 7. CONNECT OHMETER IN JACKS OF TESTER. SET ON LOW OHMS SCALE.

_____ 8. USING SELECTOR SWITCH, RECORD VALUES OF RESISTANCE FOR FOLLOWING POSITION.

	SWITCH POS.	ACTUAL VALVE	APPROX. VALVE
P1	1.	_____	21.5 – 26.0 OHMS
	2.	_____	22.5 – 27.5 OHMS
	3.	_____	22.5 – 27.5 OHMS
	4.	_____	21.5 – 26.0 OHMS
	8.	_____	40.5 – 49.5 OHMS
	9.	_____	21.0 – 26.0 OHMS
	10.	_____	21.0 – 26.0 OHMS
P3	2.	_____	INFINITE
	3.	_____	INFINITE
	13.	_____	SEE NOTE #1 #2
	10.	_____	SEE NOTE #1 #2

_____ 9. RELEASE THE FLOOR HEAT SWITCH LIGHT.

_____ 10. PULL W11 AND W12 ON CB3 AND REMOVE TESTER.

_____ 11. RECONNECT CONNECTORS TO CONTROL BOX AND RESET CB'S W11 AND W12.

NOTE: FOR POSITION 10 AND 13 ON AIRCRAFT,

#1 11001 THRU 31025 USE ATTACHED CHART.

#2 31026 THRU 31031 SHOULD READ INFINITE IF CABIN TEMP IS ABOVE 80°±5° F AND CONTINUITY IF CABIN TEMP IS BELOW 80°±5° F.

M1-0001-21-2169

CR
CR

Floor Heat Checkout Sheet
Figure 4

FLOOR HEAT SYSTEM - FAULT ISOLATION

1. General

R NOTE: On aircraft with SB21-228 incorporated,
R the floor heating system is deactivated.

SCHEM-1 contains the floor heat system schematic and heater element location, and is to be used to isolate faults in the floor heat system of the passenger cabin area over the wing center section box beam and the hydraulic service center. The schematics provide the necessary information to trace signal flow from source to termination. For troubleshooting aircraft wiring, use tables on schematics for listing of applicable diagram in wiring diagram manual.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the floor heat system. It gives the area and access of each component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

C The L1011 fleet is divided into three groups pertaining to floor
C heat. (1) Aircraft 11001-31025 designed to use original floor
C heat controller TWA Stk. Nbr. 271-3039, (2) Aircraft 31026-31031
C designed to use Lockheed new design controller TWA Stk. Nbr.
C 271-3577, and (3) Aircraft 31032-31036 which were designed with
C new type floor panels which do not require floor heat.

C The TWA approach to maintaining the two heated floor systems is
C variable depending upon the type of problem, location of problem
C and location of aircraft (field or base maintenance). In
C addition, the heated floor panels are being replaced on an
C attrition basis with a new type of unheated panel made from
C Nomex material and foam insulation bonded to the underside. The
C only exception to this is the two heated floor panels, items
C 251LB, (P/N 1540885-123 or 1612074-101) and 261EB, (P/N
C 1514332-121 or 1612070-101), which incorporate the temperature
C and overheat control switches.

2. Fault Isolation/Identification

Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

FIGURE	TITLE
TABLE 102	Heater Blanket Resistance Loads
101	Component Location Index
102	Component Locator Diagram
103	Thermistor Resistance vs Ambient Temperature
SCHEM 1	Cabin Floor Heat System Schematic

On the Flight Engineer/Second Officers upper panel, the FLOOR HEAT FAIL light will come on if any one or more of the following conditions exist:

C High temperature

C Floor heat blanket controller malfunction

C Overheat switch malfunction

C Overheat in any of the two selected areas (Ref. Fig. 102
C Component Locator Diagram)

C Loss of electrical load

C 3. REFERENCED PROCEDURES

C	25-21-05	Coach Class Conventional Leg-Type Double Seat Assembly - Removal and Installation
C	25-21-06	Coach Class Conventional Leg-Type Single Seat Assembly - Removal and Installation
C	25-25-05	Carpet Section - Removal and Installation
C	33-17-00	Annunciator System - Fault Isolation
C	33-17-04	Indicator Lights Control Box - Removal and Installation
C	53-22-00	Floor Panels, Flight Station, Passenger Compartment, and Galley - Description and Operation

C 53-22-10 Passenger Compartment Floor Panels - Removal and Installation

C 4. PROCEDURE

C The following fault isolation procedures are a step-by-step method of isolating a circuit in any of the heat blankets with a minimum of seat, carpeting and floor panel removal.

C Figure 102 includes a plan view of the floor panels over the wing center section box beam and hydraulic service center area.

C On aircraft 001-025 with original floor heat controller TWA PN A02412-1, the procedures are divided into four sub-procedures to isolate the simple faults first before proceeding into the more complex faults that require removal of seats and carpeting. Each procedure is to be performed in the order listed before proceeding to the next fault.

C On aircraft 026-031 with redesigned floor heat controller LAC PN 1591950, the procedures are divided into three sub-procedures to isolate the simple faults first before proceeding into the more complex faults that require removal of seats and carpeting. Each procedure is to be performed in the order listed before proceeding to the next fault.

C On aircraft 001-025 with original floor heat controller TWA P/N A02412-1, the first procedure (Step 4A) isolates the two thermistors; the third (Step 4C), the two overheat switches; the fourth (Step 4D), the heater blankets, and the fifth (Step 4E), the floor heat blanket controller.

C On aircraft 026-031 with redesigned floor heat controller LAC PN 1591950, the second procedure (Step 4B) isolates the two thermal switches; the third (Step 4C), the two overheat switches; the fourth (Step 4D), the heater blankets; and the fifth (Step 4F), the floor heat blanket controller.

C A. Thermistor Fault Isolation - On aircraft 001-025 with original floor heat controller TWA PN A02412-1.

C (1) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, open and tag the following circuit breakers:

C FLOOR HEAT - CONT (W11),

C FLOOR HEAT - PWR (W12).

C (2) In mid electrical service center, disconnect connectors
C 2143-P1, 2143-P2 and 2143-P3 from the floor heat
C blanket controller.

C (3) On connector 2143-P3, determine resistance value
C between pins 10 and 11, and 12 and 13. The two values
C should be approximately the same and should compare
C with the value shown on the chart in Figure 103.

C (4) No Fault or Fault

C (a) If the thermistor values are normal, proceed with
C Step 4C.

C 1) Field repair

C If a thermistor is found faulty, deactivate
C the floor heat system by placarding the
C Selector switches on the Engine Bleed Control
C Panel. Advise MCIMD, MCIES of fault condition
C and system being deactivated for follow up
C action.

C 2) Major Maintenance

C If a thermistor is found faulty, either in
C field test or major maintenance test,
C accomplish the following:

C • Remove the appropriate seat(s), carpeting
C and floor panel(s). (Ref. 25-21-05, 25-21-06,
C 25-25-05 and 53-22-10 for removal and
C installation of single and dual coach class
C seats, carpeting and floor panels).

C • Replace the faulty thermistor and reinstall
C the floor panel(s). (Ref. 53-22-00). Refer
C to Para. 4H for thermistor replacement.

C • Reconnect connectors 2143-P1, 2143-P2, and
C 2143-P3 to the floor heat blanket controller.

C • Remove tags and close circuit breakers W11
C and W12 on Flight Engineer/Second Officers aft
C circuit breaker panel, CB3.

C • On ENGINE BLEED CONTROL panel, depress the
C FLOOR HEAT switchlight and observe that the
C FAIL light remains off.

C • Reinstall seats and carpeting (Ref. 25-21-05, 25-21-06, and 25-25-05).

B. Temperature Control Switch Fault Isolation - On aircraft 026-031 with redesigned floor heat controller LAC PN 1591950.

(1) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, open and tag the following circuit breakers:

FLOOR HEAT - CONT (W11),

FLOOR HEAT - PWR (W12).

(2) In mid electrical service center, disconnect connectors 2143-P1, 2143-P2, and 2143-P3 from the floor heat blanket controller.

(3) On connector 2143-P3, determine resistance and continuity between pins 10 and 14, and 15 and 13. The resistance values should be infinite if the cabin or ambient temperature is greater than 85 degrees F (29.4 degrees C). Pins will show continuity when the cabin temperature is below 80 degrees F (26.7 degrees C).

(4) No Fault or Fault

(a) If the resistance/continuity is normal, proceed with Step 4C.

1) Field Repair

If a temperature control switch is found faulty, deactivate the floor heat system by placarding the Selector Switch on Engine Bleed Control panel. Advise MCIMD, MCIES of fault condition and system being deactivated for follow-up action.

2) Major Maintenance

If a switch is found faulty, either in field test or major maintenance test, accomplish the following:

• Remove the appropriate seat(s), carpeting and floor panel(s). (Ref. 25-21-05, 25-21-06, 25-25-05, and 53-22-10 for removal and installation of single and dual coach class seats, carpeting and floor panels).

C • Replace the faulty switch and reinstall the floor panel(s) (Ref. 53-22-00).

C NOTE: Refer to Para 4H for switch replacement.

C • Reconnect connectors 2143-P1, 2143-P2, and 2143-P3 to the floor heat blanket controller.

C • Remove tags and close circuit breakers W11 and W12 on Flight Engineer/Second Officers aft circuit breaker panel, CB3.

C • On ENGINE BLEED CONTROL panel, depress the FLOOR HEAT switchlight and observe that the FAIL light remains off.

C • Reinstall seat(s), carpeting and floor panel(s) removed in Step 4A(4)(2).

C C. Overheat Switch Fault Isolation Aircraft 001-031

C (1) On connector 2143-P3, measure resistance between electrical ground and pins 2 and 3. The resistance should be infinite (open circuit). If the switch temperature is greater than 100 degrees F (37.8 degrees C) the switch contacts will be closed and measured resistance values can be less than infinite. If the switch temperature is less than 100 degrees F, a less-than-infinite value will indicate a faulty switch or shorted wire.

C (2) No Fault or Fault

C (a) If the overheat switches indicate infinite resistance, then proceed to Step 4D.

C 1) Field Repair

C • If an overheat switch is found faulted, deactivate the floor heat system by placarding the Selector Switch on Engine Bleed Control panel. Advise MCIMD, MCIES of fault condition and system being deactivated for follow-up action.

C 2) Major Maintenance

C • If an overheat switch is found faulty, either in field test or major maintenance test, accomplish the following:

C • If a switch is found faulty, remove the appropriate seat(s), carpeting and floor panel (Ref. 25-21-05, 25-21-06, 25-25-05, and 53-22-10 for removal and installation of single and dual coach class seats, carpeting, and floor panels).

C • Replace the faulty overheat switch and reinstall the floor panel (Ref. 53-22-00).

C NOTE: Refer to Para. 4H for switch replacement.

C • Reconnect connectors 2143-P1, 2143-P2, and 2143-P3 to the floor heat blanket controller.

C • Remove tags and close circuit breakers W11 and W12 on Flight Engineer/Second Officer's aft circuit breaker panel, CB3.

C • On ENGINE BLEED CONTROL panel, degress the FLOOR HEAT switchlight and observe that the FAIL light remains off.

C • Reinstall seats and carpeting (Ref. 25-21-05, 25-21-06, and 25-25-05).

C D. Heater Blanket Fault Isolation - On Aircraft 001-014

C (1) On connector 2143-P1, perform a general resistance comparison test by measuring the resistance between electrical ground and pins 1, 2, 3, 4, 8, 9, and 10. The resistance value of pins 1, 2, 3, 4, 9, and 10 should be 21.6 to 26.4 Ohms. The resistance value for pin 8 should be 40.5 to 49.5 Ohms.

C (2) No Fault or Fault

C (a) If the resistance values are normal, then proceed to Step 4E.

C (b) Field Repair

C 1) If one or more resistance readings for test switch position 1 through 10 on P1 is higher than the listed value, this would indicate one or more heated floor panels have been replaced with an insulated fiberlom floor panel not requiring a heater element. For this condition, no additional maintenance is required for the floor panels. The remaining

components and system check should be accomplished and corrections made as required.

2) If the resistance value is less than given for any pin listed above, but not zero Ohms, this indicates a high resistance circuit or contact; this is no reason for deactivation. If the resistance is 0 to 2 Ohms, this would indicate a shorted circuit and the pin should be removed from the connector, taped, and stowed in wire bundle. Advise MCIMD and MCIES of stowed pin for follow up action.

(c) Major Maintenance

1) If one or more resistance readings for test switch position 1 through 10 on P1 is higher than the listed value, this would indicate one or more heated floor panels have been replaced with an insulated fiberlom floor panel not requiring a heater element. For this condition, no additional maintenance is required for the floor panels. The remaining components and system check should be accomplished and corrections made as required. If one or more resistance readings for the floor panel test on P1 is lower than the approximate value, but not zero, this indicates a higher than normal resistance in one or more heater elements or contacts. In this condition, no additional maintenance is required for the heated panel.

2) If a reading is showing 0 to 2 Ohms, indicating a short to ground, then perform a check at the terminal block under the floor in question to locate the short.

NOTE: If a pin has been removed during field maintenance, reinstall the pin in the connector before proceeding with corrections.

3) Remove seat(s), carpeting, and floor panel (Ref. 25-21-05, 25-21-06, 25-25-05, and 53-22-10) for removal and installation of single and dual coach class seats, carpeting, and floor panel).

4) Measure resistance between wire and ground (wire number is listed in Remarks column of Table 101). If resistance is within

C tolerance, reinstall the wire on the terminal,
C then proceed to the next group.

C 5) If the resistance is not within tolerance,
C isolate the faulty panel in the group being
C tested and disconnect the faulty heater strip
C at the terminal (Ref. 53-22-00).

C NOTE: Check the aircraft wiring before
C disconnecting floor panel; wires connecting
C the floor panels sometimes become damaged and
C shorted.

C 6) Reconnect connectors 2143-P1, 2143-P2,
C 2143-P3 to the floor heat blanket controller.

C 7) Remove tags and close circuit breakers W11
C and W12 on the Flight Engineer/Second
C Officer's aft circuit breaker panel, CB3.

C 8) On ENGINE BLEED CONTROL panel, depress the
C FLOOR HEAT switchlight and observe that the
C FAIL light remains off.

C 9) Reinstall the floor panel, carpeting, and
C seat(s). (Ref. 25-21-05, 25-21-06, 25-25-05,
C and 53-22-10).

C E. Heater Blanket Fault Isolation - On Aircraft 015-031

C (1) Remove plug 2199-P5 from receptacle 2199-J5. On
C connector 2199-J5 (zone 137 STA 980), perform a general
C resistance comparison test by measuring the resistance
C between electrical ground pin 55 and pins 1 through 47.
C The resistance value shall be those shown on Table 102
C and the decal below the floor heat controller. The
C tolerance is ± 10%.

C (2) No Fault or Fault

C (a) If the resistance values are normal, then proceed
C to Step 4F.

C (b) Field Repair

C 1) If one or more resistance readings for
C test switch position 1 through 10 on P1 is
C higher than the listed value, this would
C indicate one or more heated floor panels have
C been replaced with an insulated fiberlom floor
C panel not requiring a heater element. For
C this condition, no additional maintenance is

C required for the floor panels. The remaining components and system check should be accomplished and corrections made as required.

2) If the resistance value is less than given for any pin listed above, but not zero Ohms, this indicates a high resistance circuit or contact; this is no reason for deactivation. If the resistance is 0 to 2 Ohms, this would indicate a shorted circuit and the pin should be removed from the connector, taped, and stowed in wire bundle. Advise MCIMD and MCIES of stowed pin for follow up action.

(c) Major Maintenance

1) If one or more resistance readings for test switch position 1 through 10 on P1 is higher than the listed value, this would indicate one or more heated floor panels have been replaced with an insulated fiberlom floor panel not requiring a heater element. For this condition, no additional maintenance is required for the floor panels. The remaining components and system check should be accomplished and corrections made as required. If one or more resistance readings for the floor panel test on P1 is lower than the values listed, but not zero, this indicates a higher than normal resistance in one or more heater elements or contacts. In this condition, no additional maintenance is required for the heated panels.

2) If a reading is showing 0 to 2 Ohms, indicating a short to ground, then perform a check of each heater element on the test connector, 2199J5, located zone 137 STA 980. Refer to Table 102.

NOTE: If a pin has been removed during field maintenance, reinstall the pin in the connector before proceeding with corrections.

3) If a short is located (0 to 2 Ohms), then proceed with the following for corrections.

• Remove seat(s), carpeting, and floor panel (Ref. 25-21-05, 25-21-06, 25-25-05, and 53-22-10 for removal and installation of single and dual coach class seats, carpeting, and floor panels).

C • Locate the faulty heater strip or shorted wiring (Ref. 53-22-10).

C • If the short is in the heater strip, remove and stow wire at disconnect. If the short is in the wiring, correct wiring.

C • Reconnect connector 2199-P5 to 2199-J5.

C • Remove tags and close circuit breakers W11 and W12 on the Flight Engineer/Second Officer's aft circuit breaker panel CB3.

C • On ENGINE BLEED CONTROL panel, depress the FLOOR HEAT switchlight and observe that the FAIL light remains off.

C • Reinstall the floor panel, carpeting and seats (Ref. 25-21-05, 25-21-06, 25-25-05, and 53-22-10).

C F. Floor Heat Blanket Controller, TWA P/N A02412-1 Fault Isolation - On Aircraft 001-025

C (1) Install the floor heat blanket controller.

C (2) Remove tags and close circuit breakers opened in Step 4A(1).

C (3) On ENGINE BLEED CONTROL panel, depress the FLOOR HEAT switchlight and observe that the FAIL light remains off. If the FAIL light remains on, with cabin temperature below 100 degrees F (37.8 degrees C), fault isolate indicator light control box (Ref. 33-17-00), module 1A15 and replace if faulty (Ref. 33-17-04). Fault isolate overheat switches and thermistors and replace faulty component. At major maintenance, if both overheat, IFC switch, and thermistor are good, replace floor heat blanket controller.

C G. Floor Heat Blanket Controller LAC P/N 1591950 Fault Isolation - On Aircraft 026-031

C (1) Install the floor heat blanket controller.

C (2) Remove tags and close circuit breakers opened in Step 4A(1).

C (3) On ENGINE BLEED CONTROL panel, depress the FLOOR HEAT switchlight and observe that the FAIL light remains off when cabin and/or ambient temperature is below 100 degrees F (37.8 degrees C). If the FAIL light remains

C on, fault isolate indicator light control box (Ref. 33-17-00 module 1A15). If the fault still persists, fault isolate overheat switches and temperature control switches and replace the faulty switch. If both switches IFC are good, replace Floor Heat Blanket controller.

H. Thermistor or Thermoswitch Replacement

NOTE: Before replacing thermistor or thermoswitch, disconnect thermistor or thermoswitch and check aircraft wiring to ensure wire is not shorted or open.

(1) Install RTH06AS301F Thermistor (LS45P2143A9RT1). Aircraft 001-025.

(2) Install LS10791-080U2A Thermoswitch (LS45P2143A9S1) in same location as the removed thermoswitch. Aircraft 026-031.

(3) Install LS19791-100U1A overheat thermoswitch. Aircraft 001-031.

NOTE: The thermoswitch and thermistor body must be in contact with floor board surface.

(a) Clean the surface with clean cloth saturated with LCM32-1087 Solvent or equivalent. (See Section 8). The surface shall be wiped dry with clean dry cloths. Do not allow the cleaner to air dry.

(b) Apply LCM30-2085, Type 1, Adhesive or equivalent (RTV 154) (See Section 3) around the perimeter of thermoswitch. Allow four hours for tack free cure time.

	TERM BD CONNECTION				HEATER BLANKETS				
							OHMS ±10%		
2143 -P1 PIN NO.	TB NO.	TERM	PNL NO.	DISC WIRE NO.	HR NO.	PNL NO.	HR RES	PARALLEL RES	REMARKS
1	34-1 34-1	C A	252FB 252FB	18B-V 18C-V	7 8	252FB 252FB	210 210	*105	*CONNECT WIRES 18B-V AND 18C-V, THEN TEST TO GROUND
	34-1	F	252FB	18F20V	9 10 29 30	251MB 251MB 251TB 251TB	210 210 210 210	52.5	TEST BETWEEN 18F20V AND GROUND
	34-1	E	252FB	18R20V	27 28 91	252KB 252KB 252KB	210 592 391	117	TEST BETWEEN 18R20V AND GROUND
	34-1	D	252FB	18N20V	25 26	252LB 252LB	432 432	218	TEST GROUND 18R20V AND GROUND
2	35-1 35-1	B C	251PB 251PB	19J-V 19K-V	17 18	251HB 251HB	210 210	*105	*CONNECT WIRE 19J-V AND 19K-V, THEN TEST TO GROUND
	35-1	A	251PB	19S20V	15 16	251JB 251JB	210 210	105	TEST BETWEEN 19S20V AND GROUND
	35-1	D	251PB	19H20V	19 20 39 40 51 52	251GB 251GB 251NB 251NB 251UB 251UB	210 210 620 432 687 687	58.2	TEST BETWEEN 19H20V AND GROUND
	35-1 35-1	F K	251PB 251PB	19N-V 19P-V	37 38	251PB 251PB	432 432	*218	*CONNECT WIRES 19N-V AND 19P-V, THEN TEST TO GROUND
3 (SEE SHT 2)	26-1	F E	252NB 252NB	16K-V 16J-V	1 2	252JB 252JB	210 210	*105	*CONNECT WIRES 16K-V AND 16J-V, THEN TEST TO GROUND
	26-1	D	252NB	16H20V	3 4 5 6 23 24 41 42	252HB 252HB 252GB 252GB 252MB 252MB 252RB 252RB	210 210 210 210 432 620 687 687	34.4	TEST BETWEEN 16H20V AND GROUND

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CR Heater Blanket Resistance Loads
CR Table 102 (Sheet 1)

2U3 -P1 PIN NO.	TERM BD CONNECTION				HEATER BLANKETS				REMARKS
							OHMS ±10%		
	TB NO.	TERM	PNL NO.	DISC WIRE NO.	HR NO.	PNL NO.	HR RES	PARALLEL RES	
3 (CONT)	26-1	B	252NB	16Q-V	21	252NB	432	*218	*CONNECT WIRES 16Q-V AND 16P-V, THEN TEST TO GROUND
	26-1	C	252NB	16P-V	22	252NB	422		
4	29-1	B	251KB	21L-V	13	251KB	210	*105	*CONNECT WIRES 21L-V AND 21K-V, THEN TEST TO GROUND
	29-1	F	251KB	21K-V	14	251KB	210		
	29-1	C	251KB	21Q22V	11	251LB	210	54.3	TEST BETWEEN 21Q22V AND GROUND
					12	251LB	210		
					31	251SB	210		
					32	251SB	592		
					90	251SB	392		
	29-1	D	251KB	21J20V	33	251RB	210	105	TEST BETWEEN 21J20V AND GROUND
					34	251RB	210		
	29-1	E	251KB	21S20V	35	251QB	432	218	TEST BETWEEN 21S20V AND GROUND
					36	251QB	432		
8	58-1	A	261FB	22E20V	72	262AB	358	179	TEST BETWEEN 22E20V AND GROUND
					73	262AB	358		
	58-1	B	261FB	22FV	74	261FB	358	*	*SINGLE HR TEST
	58-1	C	261FB	22T20V	75	261FB	358	71.6	TEST BETWEEN 22T20V AND GROUND
					76	261EB	358		
					77	261EB	358		
					78	261DB	358		
					79	261DB	358		
9 (SEE SHT 3)	42-1	B	252TB	17B-V	43	252QB	687	*344	*CONNECT WIRES 17B-V AND 17C-V, THEN TEST TO GROUND
	42-1	C	252TB	17C-V	44	252QB	687		
	42-1	D	252TB	17J20V	45	252PB	687	344	TEST BETWEEN 17J20V AND GROUND
					46	252PB	687		
	42-1 (CONT ON SHT 3)	E	252TB	17M20V	53	252UB	687	27.4	TEST BETWEEN 17M20V AND GROUND
					54	252UB	687		
					55	252TB	687		
					56	252TB	687		
					57	252SB	687		
					58	252SB	687		
					65	262EB	210		
					66	262EB	210		
					CONTINUED ON SHT 3				

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Heater Blanket Resistance Loads
Table 102 (Sheet 2)

2143 -P1 PIN NO.	TERM BD CONNECTION				HEATER BLANKETS				REMARKS
							OHMS ±10%		
	TB NO.	TERM	PNL NO.	DISC WIRE NO.	HR NO.	PNL NO.	HR RES	PARALLEL RES	
9 (CONT)	42-1 (CONT)	E	252TB	17M120V	67	262DB	210		SEE SHEET 2 FOR REMARKS AND TOTAL PARALLEL RESISTANCE
					68	262DB	210		
					69	262BB	210		
					70	262BB	432		
					71	262BB	687		
10	41-1	A	251ZB	20E-V	47	251WB	687	*	*SINGLE HR TEST
	41-1	C	251ZB	20F20V	48	251WB	687		TEST BETWEEN 20F20V AND GROUND
					49	251VB	687	229	
					50	251VB	687		
	41-1	D	251ZB	20N20V	59	251ZB	687		TEST BETWEEN 20N20V AND GROUND
					60	251ZB	687		
					61	251YB	687		
					62	251YB	687		
					63	251XB	687		
					64	251XB	687		
					80	261CB	432	27.4	
					81	261CB	687		
					82	261CB	210		
					83	261BB	210		
					84	261BB	210		
					85	261AB	210		
					86	261AB	210		

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Heater Blanket Resistance Loads
Table 102 (Sheet 3)

CONTROLLER 2143-P1 CONTACT	2199-J5 TEST CONNECTOR CONTACTS	2199-J5-55 RESISTANCE RANGE OHMS	FLOOR PANEL REF. NO.
2	1	94.5 - 115.5	1
	2	223.2 - 272.8	2
	3	310.5 - 379.5	3
	4	94.5 - 115.5	6
	5	193.5 - 236.5	7
	6	94.5 - 115.5	11
4	8	193.5 - 236.5	12
	9	94.5 - 115.5	16
	10	94.5 - 115.5	17
	11	94.5 - 115.5	18
	12	102.6 - 125.4	19
1	14	94.5 - 115.5	20
	15	94.5 - 115.5	21
	16	94.5 - 115.5	22
	17	102.6 - 125.4	23
	18	193.5 - 236.5	25
3	20	94.5 - 115.5	24
	21	94.5 - 115.5	29
	22	232.2 - 272.8	30
	23	94.5 - 115.5	34
	24	193.5 - 236.5	35
	25	310.5 - 379.5	36
10	27	310.5 - 379.5	4
	28	94.5 - 115.5	5
	29	310.5 - 379.5	8
	30	310.5 - 379.5	9
	31	94.5 - 115.5	10
	32	310.5 - 379.5	13
	33	310.5 - 379.5	14
	34	102.6 - 125.4	15
8	36	162.0 - 198.0	39
	37	162.0 - 198.0	40
	38	162.0 - 198.0	41
	39	162.0 - 198.0	42
9	40	310.5 - 379.5	26
	41	310.5 - 379.5	27
	42	102.6 - 125.4	28
	43	310.5 - 379.5	31
	44	310.5 - 379.5	32
	45	94.5 - 115.5	33
	46	310.5 - 379.5	37
	47	94.5 - 115.5	38

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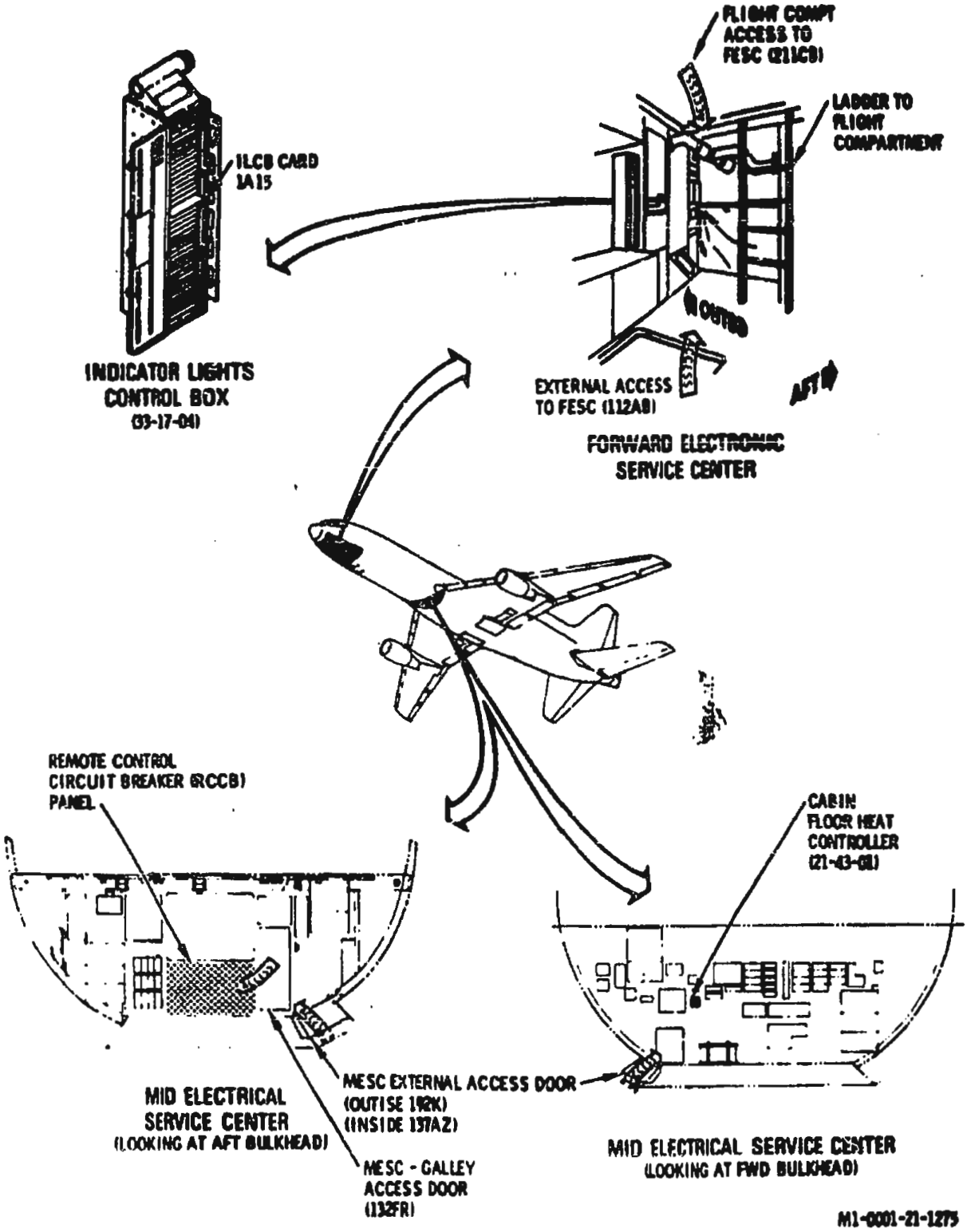
Heater Blanket Resistance Load
Table 102

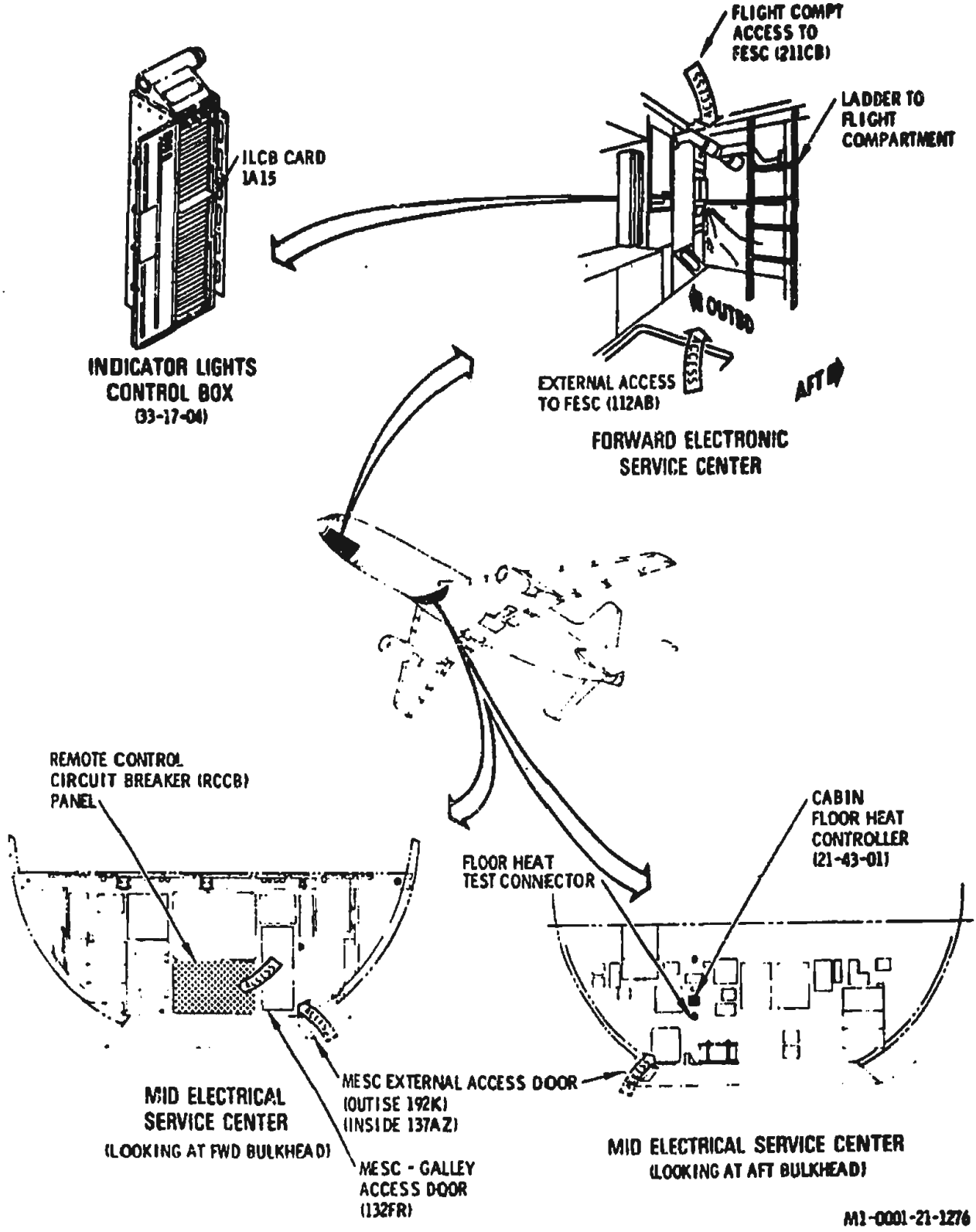
COMPONENT	QTY	AREA/ACCESS	REFERENCE
BOX – INDICATOR LIGHTS CONTROL ILCB CARD 1A15	1	FESC, AFT RH SIDE, FS 245/112AB	33-17-04
CIRCUIT BREAKERS:			
FLOOR HEAT – CONT (2143-CB2)	1	FLT STA/CB3 (W11)	*
FLOOR HEAT – PWR (2143-CB1)	1	FLT STA/CB3 (W12)	*
CONTROLLER – CABIN FLOOR HEAT	1	MESC, RH SIDE, AFT BULKHEAD/192K, 137AZ	21-43-01
PANELS – CABIN FLOOR HEAT	42	CABIN FLOOR/FS 980 TO FS 1363	53-22-10
REMOTE CONTROL CIRCUIT BREAKERS (RCCB) FLOOR HEAT POWER (2143-CB3)	1	MESC, FWD BULKHEAD, LOWER CENTER/192K, 137AZ	20-24-03
SWITCH – OVERHEAT TEMPERATURE (100°F/38°C)	2	CABIN FLOOR/FS 980 TO FS 1363 (SEE FIG. 102)	21-43-07
SWITCHLIGHT – FLOOR HEAT	1	FLT STA, FE/SO CABIN TEMP CONTROL PANEL/P11	20-33-01

M1-0002-21-1274

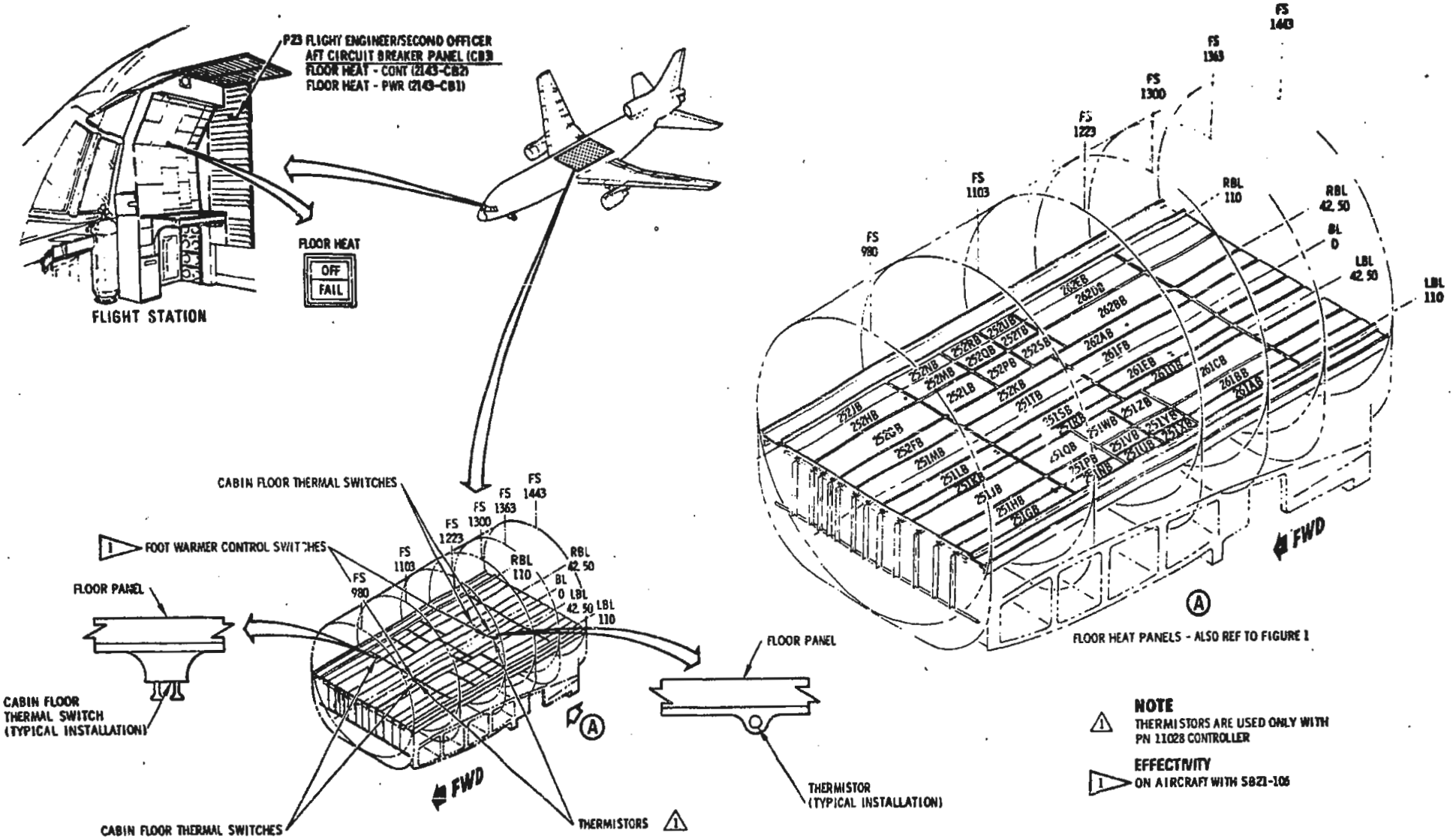
R Component Location Index
R Cabin Floor Heat System
R Figure 101


FLIGHT COMPT ACCESS TO FESC (211CB)
LADDER TO FLIGHT COMPARTMENT
ILCB CARD 1A15
INDICATOR LIGHTS CONTROL BOX (33-17-04)
EXTERNAL ACCESS TO FESC (112AB)
AFT
FORWARD ELECTRONIC SERVICE CENTER
REMOTE CONTROL CIRCUIT BREAKER (RCCB) PANEL
CABIN FLOOR HEAT CONTROLLER (21-43-08)
MESC EXTERNAL ACCESS DOOR (OUTISE 192K) (INSIDE 137AZ)
MID ELECTRICAL SERVICE CENTER (LOOKING AT AFT BULKHEAD)
MESC - GALLEY ACCESS DOOR (132FR)
MID ELECTRICAL SERVICE CENTER (LOOKING AT FWD BULKHEAD)
M1-0001-21-1275

Component Locator Diagram
Cabin Floor Heat System
Figure 102 (Sheet 1)


FLIGHT COMPT ACCESS TO FESC (211CB)
LADDER TO FLIGHT COMPARTMENT
ILCB CARD 1A15
INDICATOR LIGHTS CONTROL BOX (33-17-04)
OUTBD
EXTERNAL ACCESS TO FESC (112AB)
AFT
FORWARD ELECTRONIC SERVICE CENTER
REMOTE CONTROL CIRCUIT BREAKER (RCCB) PANEL
CABIN FLOOR HEAT CONTROLLER (21-43-01)
FLOOR HEAT TEST CONNECTOR
MESC EXTERNAL ACCESS DOOR (OUTSIDE 192K) (INSIDE 137AZ)
MID ELECTRICAL SERVICE CENTER (LOOKING AT FWD BULKHEAD)
MESC - GALLEY ACCESS DOOR (132FR)
MID ELECTRICAL SERVICE CENTER (LOOKING AT AFT BULKHEAD)
M1-0001-21-1276

Component Locator Diagram
Cabin Floor Heat System
Figure 102 (Sheet 1)



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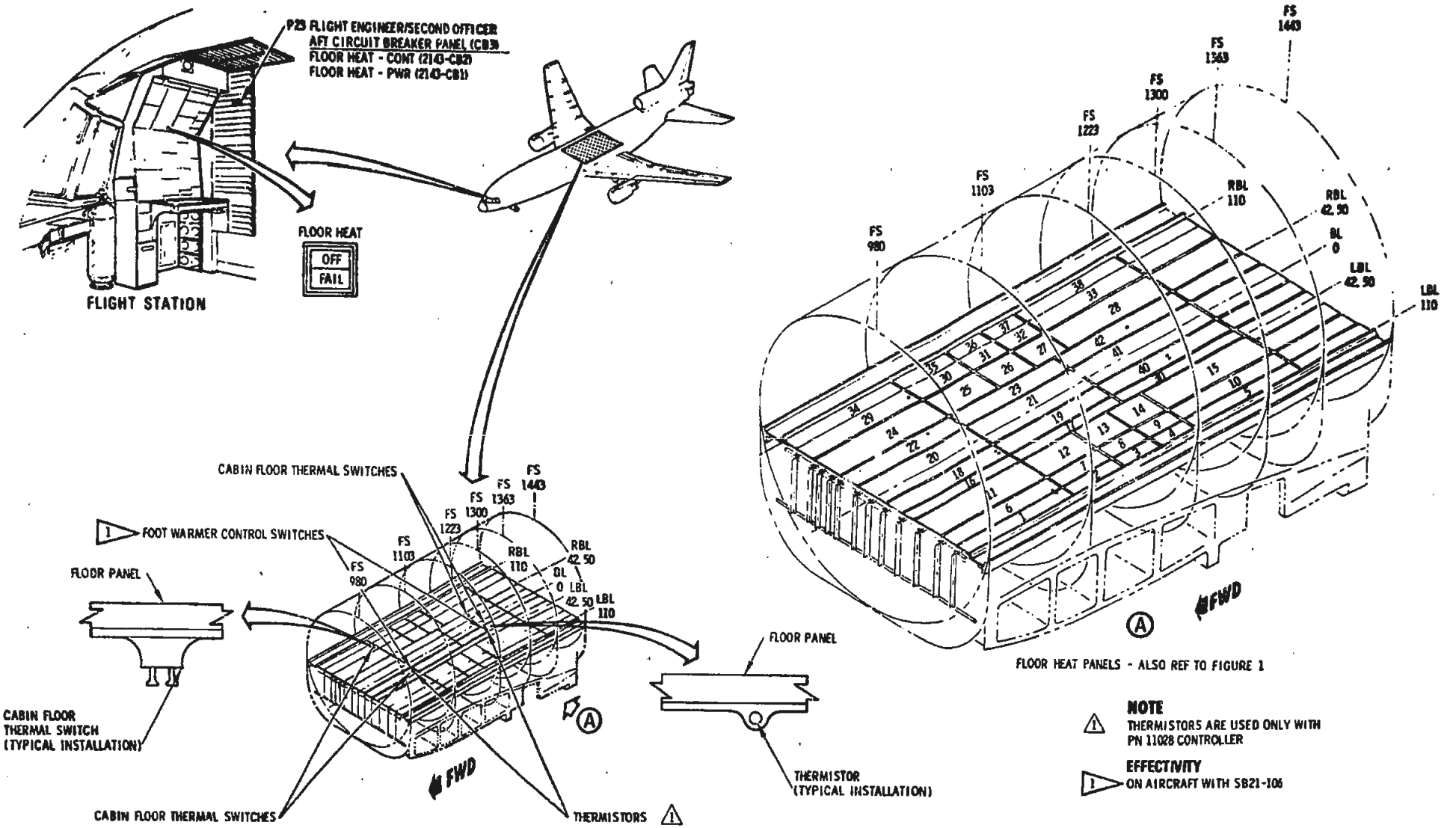
CR
CR

Component Locator Diagram
Figure 102 (Sheet 2)

EFFECTIVITY: 001-014

002B



NOTE

1. THERMISTORS ARE USED ONLY WITH PN 11028 CONTROLLER

EFFECTIVITY

1. ON AIRCRAFT WITH SB21-106

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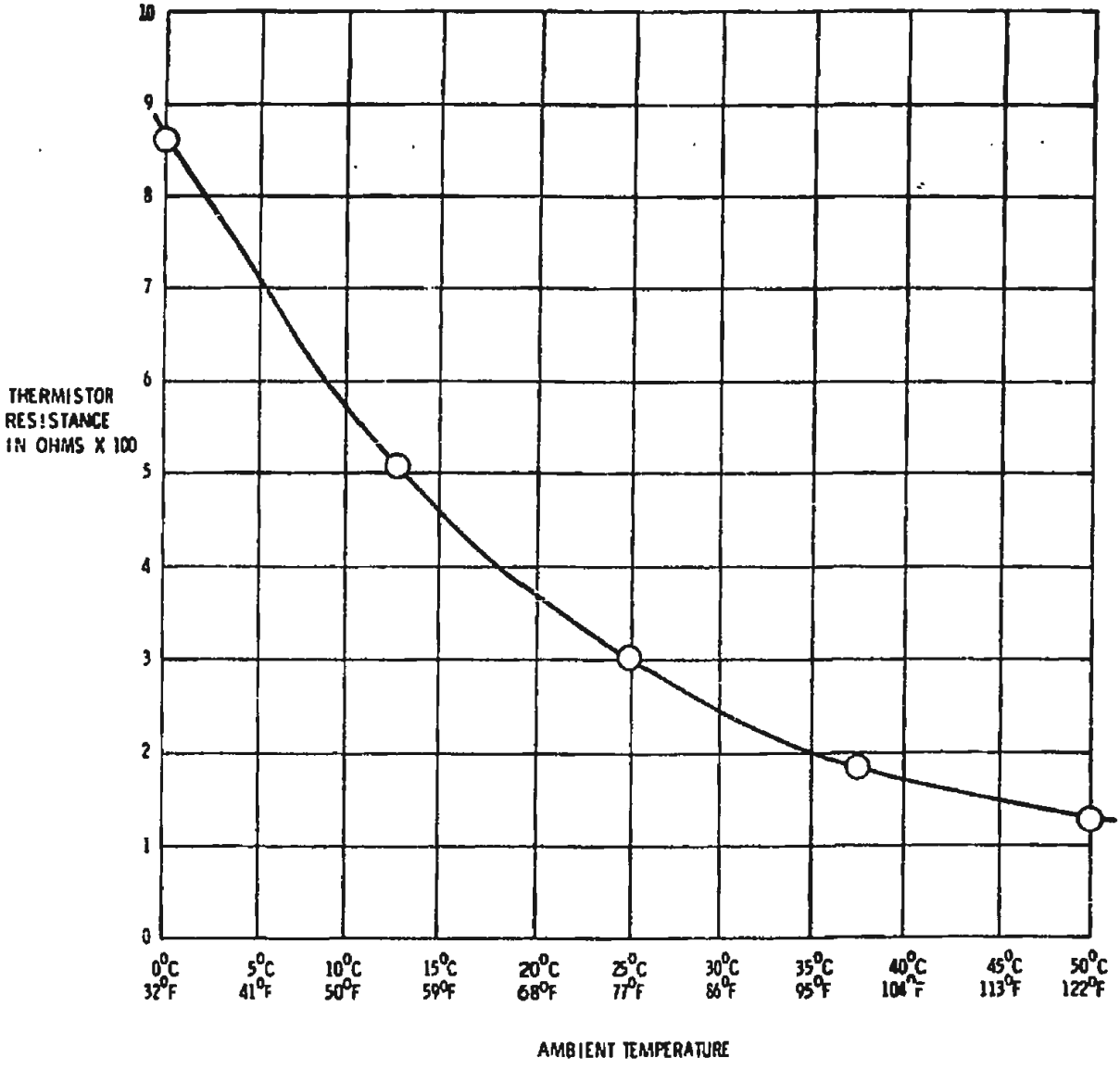
CR
CR

Component Locator Diagram
Figure 102 (Sheet 2)

EFFECTIVITY: 015-031

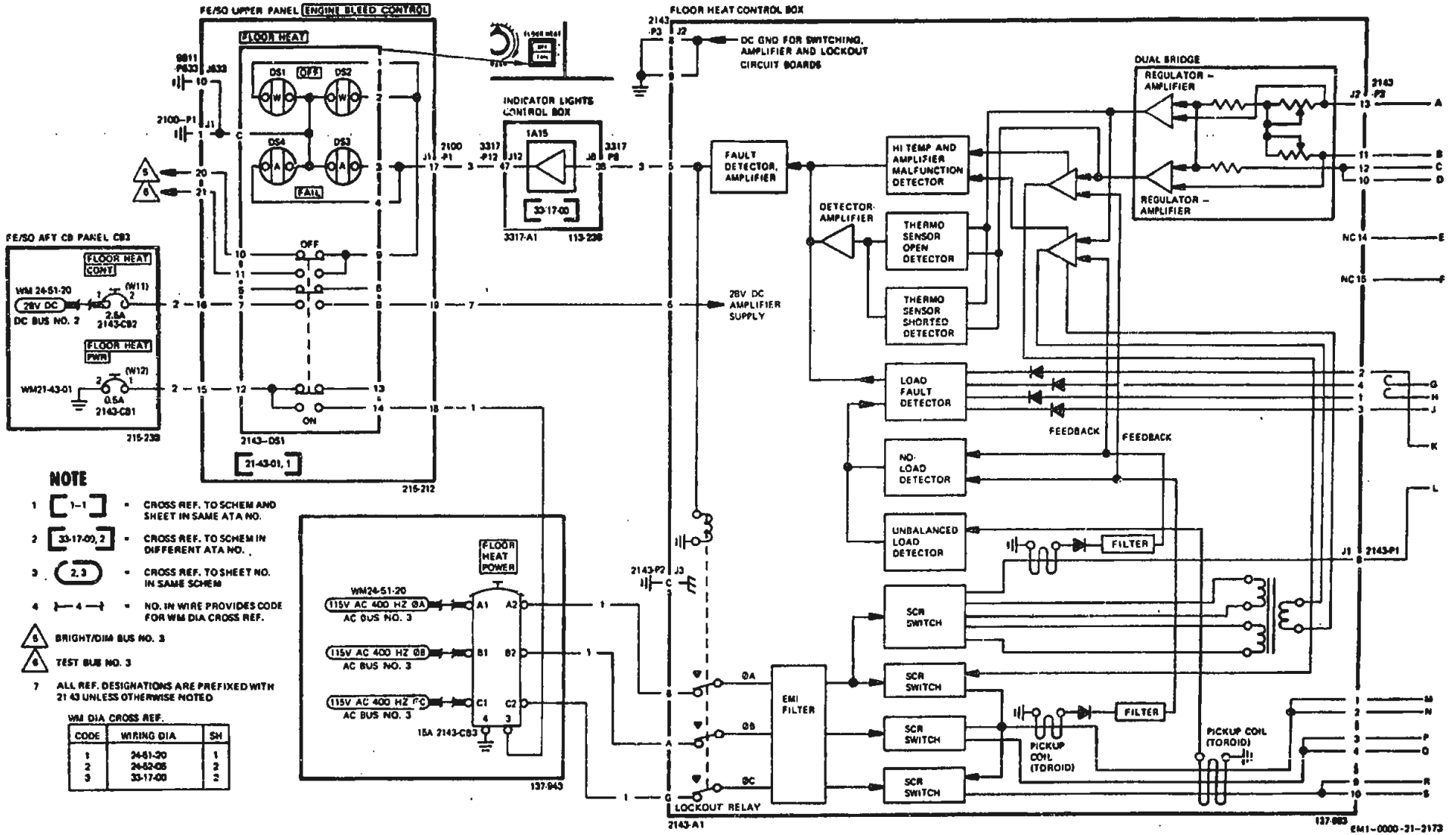
002B



MA 2810
MI-0100-21-903

R Thermistor Resistance vs Ambient Temperature
R Figure 103

R EFFECTIVITY: 001-031
R
002B



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CR
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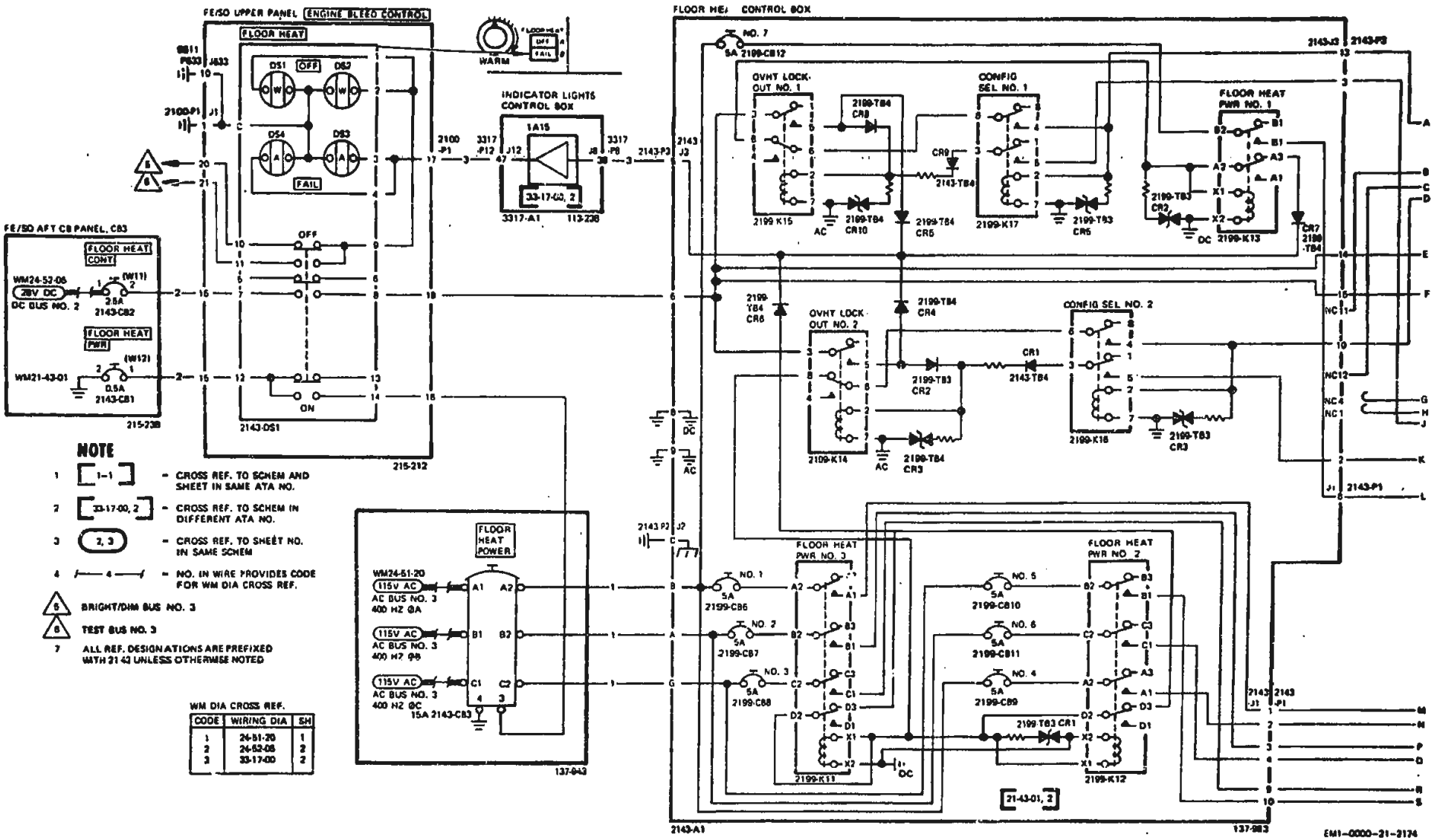
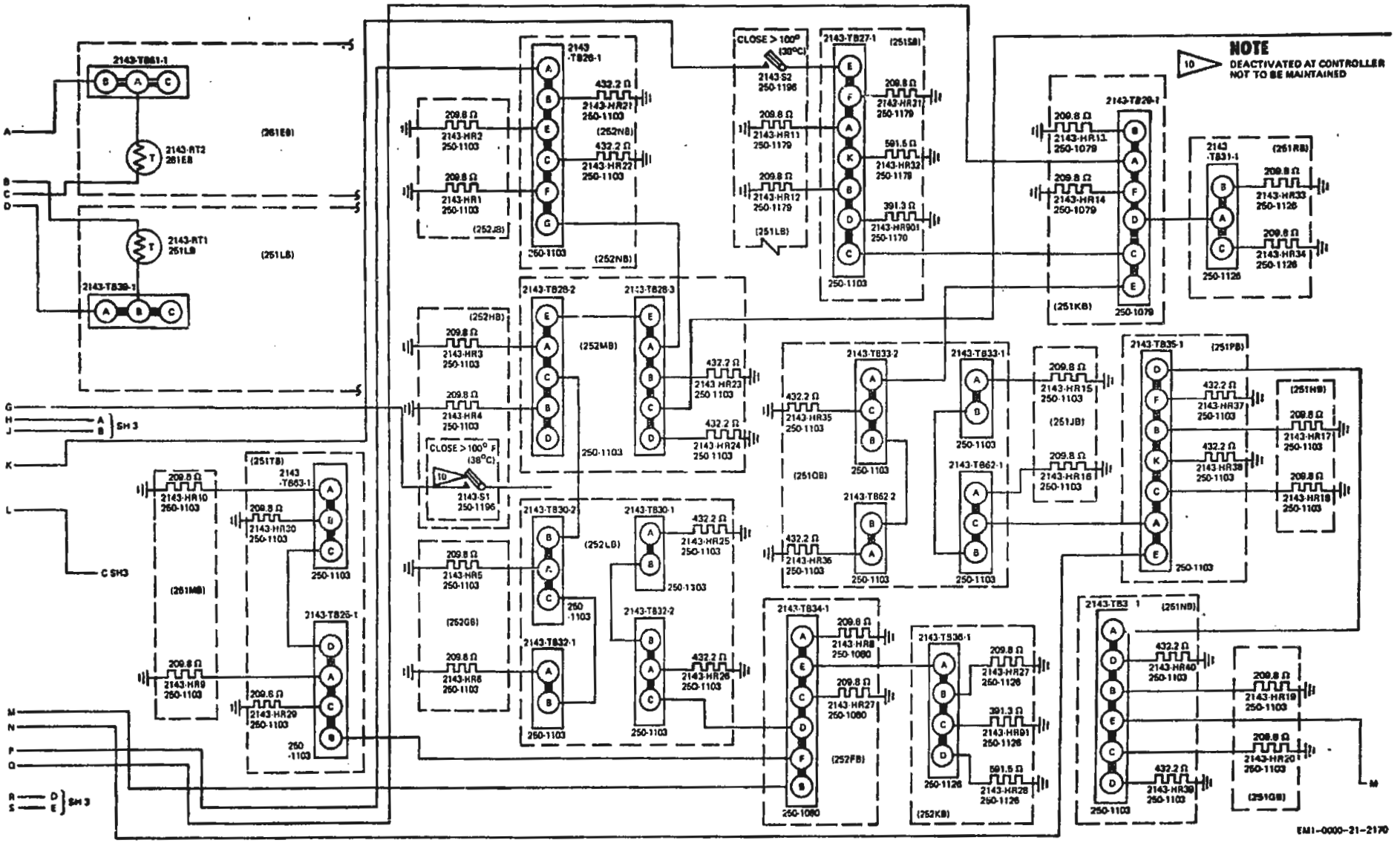
Cabin Floor Heat System Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: 001-025 WITH ORIGINAL CONTROL
R PN 11028, STK NBR A02412-1
002B



CR Cabin Floor Heat System Schematic
CR SCHEM 1 (Sheet 1)

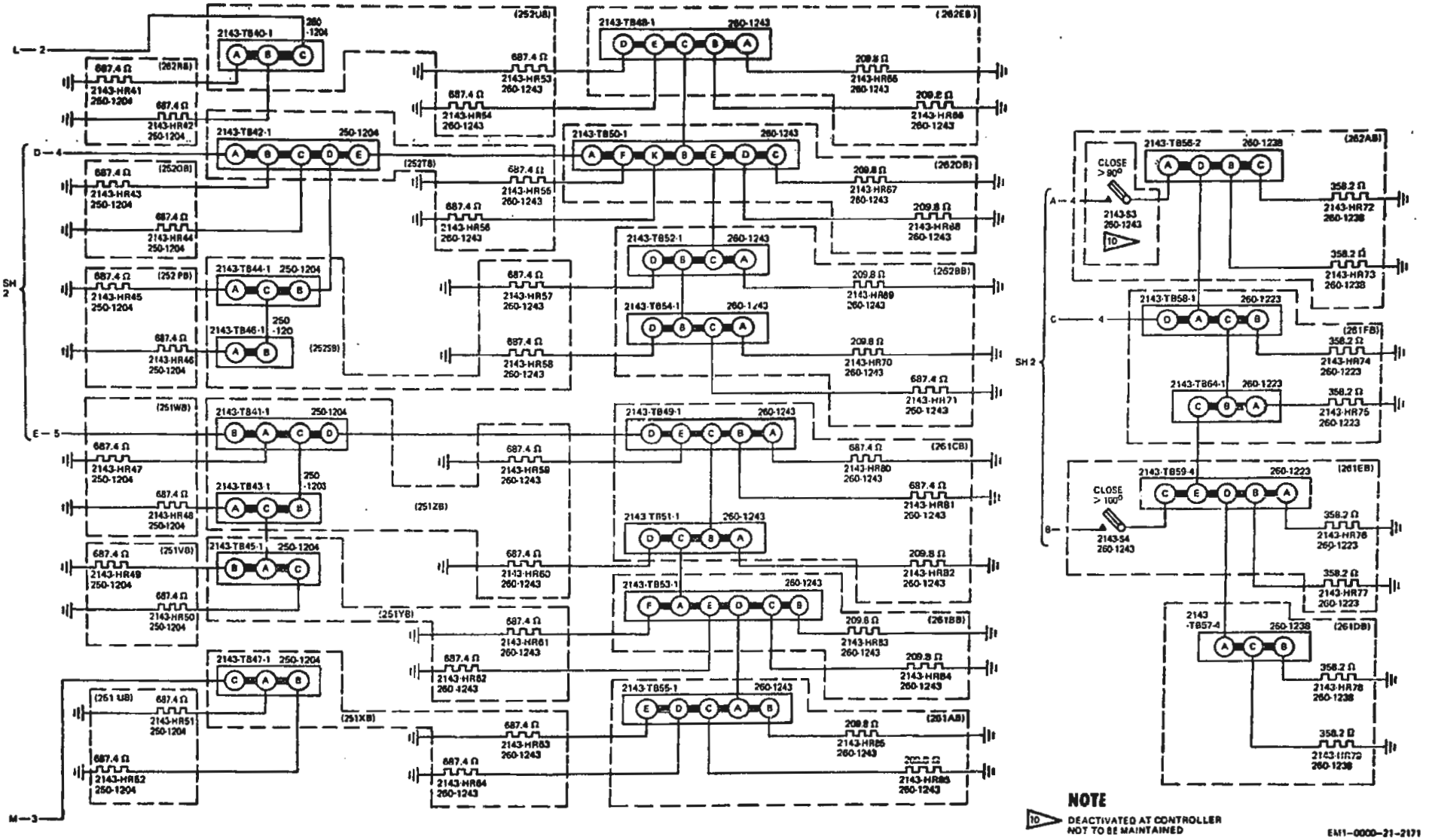
R EFFECTIVITY: 026-031
R
002B



Cabin Floor Heat System Schematic
SCHEM 1 (Sheet 2)

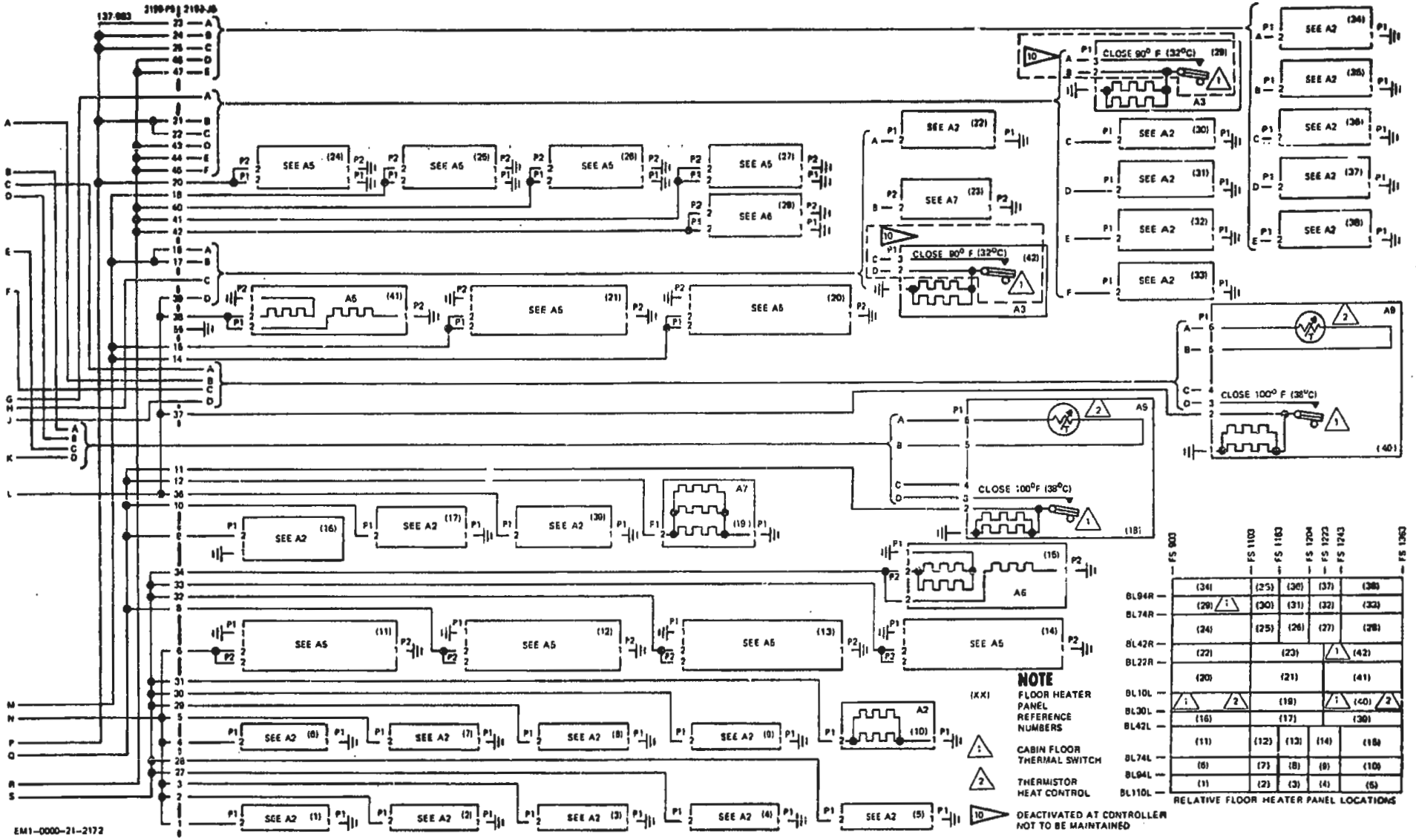
CR
CR

R EFFECTIVITY: 001-014
R
002B



CR Cabin Floor Heat System Schematic
CR SCHEM 1 (Sheet 3)

R EFFECTIVITY: 001-014
R
002B



CR Cabin Floor Heat System Schematic
CR SCHEM 1 (Sheet 2)

R EFFECTIVITY: 015-025
R
002B

FLOOR HEAT SYSTEM - MAINTENANCE PRACTICES

1. General

The floor heat system is deactivated by pulling and tagging the FLOOR HEAT CONT (3W11) and FLOOR HEAT PWR (3W12), circuit breakers on the FE/SO Aft Circuit Breaker Panel CB3. FLOOR HEAT CONT circuit breaker 3W11 provides 28V DC and the FLOOR HEAT PWR circuit breaker 3W12 provides a control ground to the three-phase FLOOR HEAT POWER remote controlled circuit breaker.

2. Floor Heat System Deactivation

NOTE: This deactivation procedure applies only when an aircraft is to be dispatched in accordance with the MEL.

A. Open and tag the following circuit breakers on the FE/SO Aft Circuit Breaker Panel CB3:

FLOOR HEAT CONT (3W11)

FLOOR HEAT PWR (3W12)

B. Install placard on the FE/SO CABIN TEMP CONTROL panel, lower right side, FLOOR HEAT SYSTEM INOPERATIVE.

C. Make appropriate entry in airplane log book.

C 3. Floor Heat Floor Panels

C One or more floor heat panels, other than heat control panels,
C No.'s 18, 29, 40 and 42 may be inoperative if power wires are
C removed from connector, taped and stowed.

C A complete heated floor panel, other than heat control panels
C No.'s 18, 29, 40 and 42, may be replaced with an insulated
C fiberlom floor panel.

C Reference Floor Heat System - Fault Isolation - starting on page
C 101.

C CABIN FLOOR HEATER SYSTEM - ADJUSTMENT AND TEST

C 1. GENERAL

R NOTE: On aircraft with SB21-228 incorporated,
R the cabin floor heater system is deactivated.

C The cabin floor heating system is located in the mid passenger
C cabin area over the center wing box beam section, main wheel
C well area and hydraulic service center, Zone 250. The system
C compensates for heat lost through the cabin floor seat rails and
C the unpressurized area below the floor. The cabin floor heater
C system consists of a floor heat control box, heater strip
C panels, two overheat switches, two temperature control switches
C or thermistors. The following system component circuitry check
C approach should be used before proceeding into the more complex
CR checks that require seat and carpeting removal. The proper
C component circuitry wiring schematics, graphs, and tables for
C system step by step procedure is referenced in fault isolation
C section 21-43-00, Schem -1, Figure 101, Figure 102, Figure 103.

C 2. EQUIPMENT AND MATERIALS

C Protective Caps

C Multimeter, HP-34702A or equivalent

C 3. REFERENCED PROCEDURES

C 21-43-00 Floor Heat System - Fault Isolation

C 21-43-01 Cabin Floor Heat Blanket Controller - Removal and
C Installation

C 24-00-00 Electrical Power - Maintenance Practices

C 33-17-04 Indicator Light Control Box - Card Removal and
C Installation

C 4. ADJUSTMENT/TEST

C A. Functional Test

C (1) Turn on electrical power (Ref. 24-00-00).

C (2) On Flight Engineer/Second Officers (FE/SO) aft circuit
C breaker panel, CB3, Zone 215, verify the following
C circuit breakers are closed:

C FLOOR HEAT - CONT (W11),

C FLOOR HEAT - PWR (W12).

C (3) On FE/SO overhead circuit breaker panel CB2, Zone 215,
C verify the following circuit breakers are closed:

C INDICATOR - F/E IND LT TEST - 1 (H1),

C INDICATOR - F/E IND LT TEST - 2 (H2),

C INDICATOR - F/E IND LT TEST - 3 (H3),

C INDICATOR - F/E IND LT TEST - 4 (H4),

C INDICATOR - F/E IND LT TEST - 5 (H5).

C (4) On Engine Bleed Control panel, depress the FLOOR HEAT
C switchlight and verify that the FAIL switch light is
C off.

C (5) Verify that the passenger cabin ambient temperature is
C below 100 degrees F (37.8 degrees C). If passenger
C cabin temperature is in excess of 100 degrees F (37.8
CR degrees C), the overheat switches may have faulted the
C system.

C (6) If the FAIL light remains on with the passenger cabin
C ambient temperature below 100 degrees F (37.8 degrees
C C), fault isolate the indicator light control box
C module 1A15 (Ref. 33-17-04).

C (7) Remove and install new module 1A15 (Ref. 33-17-04).

C (8) If the FAIL light remains on, fault isolate the floor
C heat blanket controller (Ref. 21-43-01).

C (9) If the FAIL light remains on after replacement of the
C indicator light control box module and the floor heat
C blanket controller box, fault isolate the overheat
C switches, control switches, thermistors and heater
C blankets in the system (Ref. 21-43-00).

C (10) Turn off electrical power (Ref. 24-00-00).

C (11) Open and tag circuit breakers closed in Steps 4A(2) and
C 4A(3).

C (12) In mid electrical service center, Zone 137, disconnect
C 2143-P1, P2 and P3 plugs from floor heat blanket
C controller box. Install protective caps on controller
C box receptacles.

C (13) On 2143-P1 and P3 plugs, perform a general resistance
C comparison test on each heater blanket group by
C measuring the resistance and continuity between pins
C and aircraft ground in applicable section (Ref.
C 21-43-00).

C (14) Verify that the resistance values are in comparison as
C listed in applicable tables and graphs. If faulted the
CR resistance values are noticeable on the meter, if
C shorted the meter will show 0-5 ohms.

C (15) In mid cabin passenger compartment, remove applicable
C seats and carpeting sections for the fault area (Ref.
C 21-43-00).

C (16) Disconnect and replace the applicable faulted overheat
C switches, control switches, thermistors or individual
C heater blankets as required (Ref. 21-43-00).

C (17) Verify that the continuity and resistance values for
C individual heater blankets or heater blanket group is
C as in Step 4A(13). When an open circuit is found,
C check the floor panel to determine if it has been
C replaced with an unheated panel which can be identified
C by the cover sheet material and part number. The
C replacement panel will be fiberglass sheet over
C honeycomb core in lieu of the metal sheet. As floor
C panels fail structurally, they are being replaced by
C TWA manufactured panel, except for the two heat control
C panel numbers 251LB, (18) and 261EB (40). Refer to IPC
C Chapter 53 - Floor Panels.

C (18) Remove protective caps and connect 2143-P1, P2 and P3
C plugs to the floor heater blanket controller.

C (19) Turn on electrical power (Ref. 24-00-00).

C (20) Remove tags and close circuit breakers, opened in Step
C 4A(11).

C (21) Verify that the FAIL light is off and the mid cabin
C floor heating system is operating properly, as in Step
C 4A(4).

C (22) Turn off electrical power (Ref. 24-00-00).

C (23) Install applicable carpeting and seats, removed in Step
C 4A(15).

CABIN FLOOR HEAT CONTROLLER - REMOVAL AND INSTALLATION

1. General

The cabin floor heat controller is located on the aft bulkhead of the mid electrical service center (MESC), zone 137 (Ref. Fig. 401).

2. Equipment and Materials

Protective Caps (Electrical plug and connector)

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer (FE/SO) aft circuit breaker panel, CB3, open and tag the following circuit breakers:

FLOOR HEAT - CONT (W11),

FLOOR HEAT - PWR (W12).

(2) Disconnect P1, P2 and P3 (aircraft harness) from the Floor Heat Controller and put protective caps on plugs and connectors.

(3) Remove Floor Heat Controller by removing 4 screws from the base (Ref. Fig. 401).

B. Installation

(1) Verify circuit breakers opened in Step 3A(1) are still open and tagged.

(2) Install Floor Heat Controller and tighten 4 screws at the base (Ref. Fig. 401).

(3) Remove caps from the plugs P1, P2 and P3 and connect to the corresponding connectors on the floor heat controller.

(4) Remove tags and close circuit breakers opened in Step 3A(1).

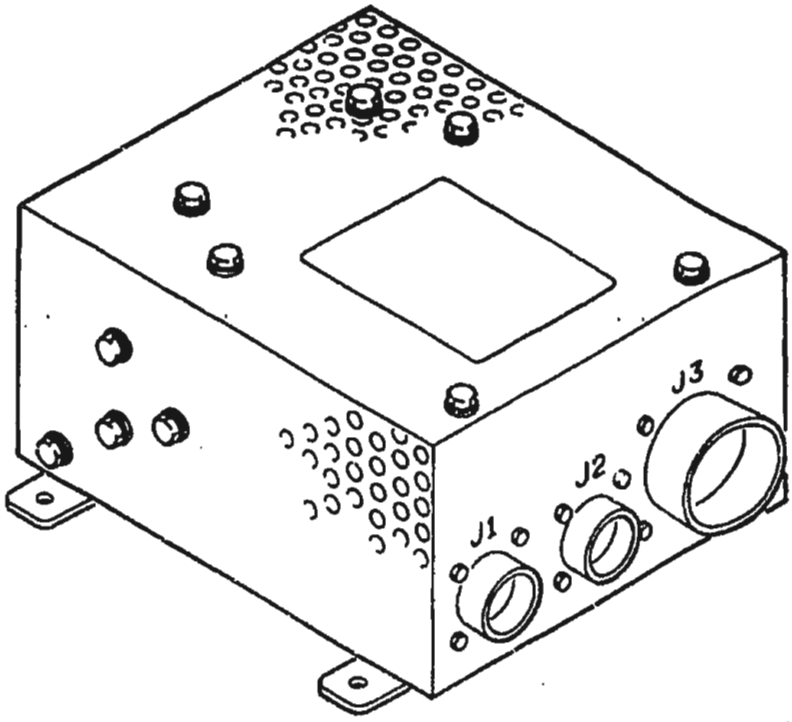
C CR (5) On Aircraft 001-025 with original Floor Heat Controller TWA P/N A92412-1,

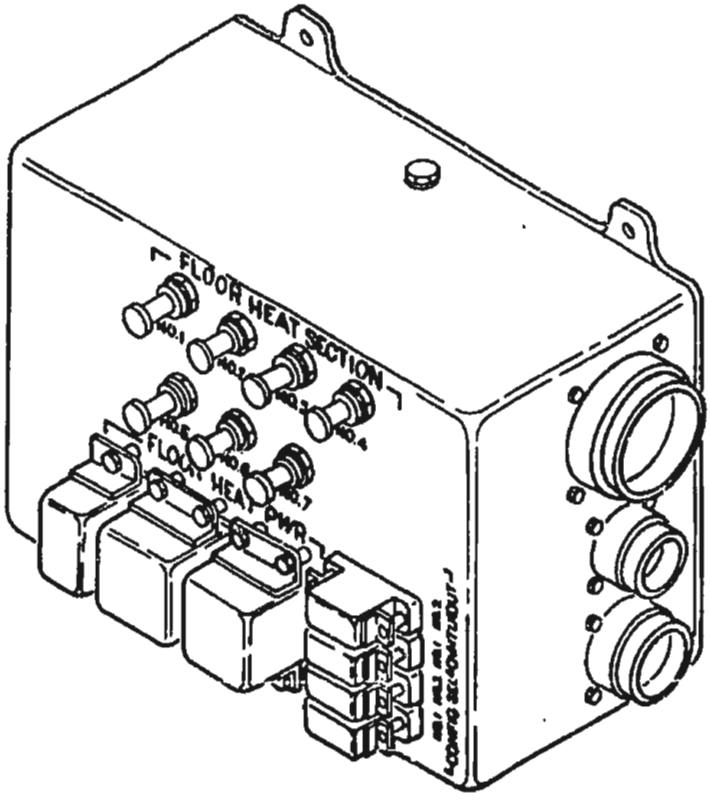
CR C CR C C — on FE/SO Cabin Temp Control Panel, depress FLOOR HEAT switchlight and verify FAIL light is off when cabin temperature is below 100 degrees F. Release FLOOR HEAT switchlight and verify OFF light is illuminated and FAIL is off.

C C C C CR C C — (6) On aircraft 026-031 with redesigned Floor Heat Control Box LAC P/N 1591950, on FE/SO Cabin Temp Control Panel depress FLOOR HEAT switchlight and verify FAIL light is off when cabin temperature is below 100 degrees F. Release FLOOR HEAT switchlight and verify OFF light is illuminated and FAIL is off.

P/N A02412-1 (DCC P/N 1028 MODIFIED TO TW P/N)

USED ON AIRCRAFT 001-025





P/N LCC 1591950

USED ON AIRCRAFT 026-031

M1-0000-21-2164

C
C Floor Heat Blanket Controller - Removal and Installation
C Figure 401

R EFFECTIVITY: 001-031 WITH REDESIGNED CONTROLLER
R AND WITHOUT SB21-228

001B

C FLIGHT STATION FOOT WARMER SYSTEM - DESCRIPTION AND OPERATION

C A. Description and Operation

C The pneumatic foot warmers are used only by the Captain and
C First Officer. The foot warmers blow hot air from the zone
C trim manifold (Ref. 21-61-00) on to the pilots feet. Each
C pilot has individual control, by means of a cable controlled
C valve, over the amount of hot air desired.

C The system consists of a pressure regulator, two control
C valves, and two diffusers.

C The regulator valve is mounted on the forward side of the FS
C 328 canted bulkhead (Ref. Fig. 3) beneath the zone trim
C manifold, zone 113. A duct for each pilots foot warmer
C leaves the regulator and runs along the right wall of the
C forward electronic service center, close to the ceiling, to
C FS 140. The First Officers duct turns upward to go through
C the control valve and then through the flight station floor
C to the foot warmer diffuser. The Captains duct runs across
C the aircraft and then turns up to go through the control
C valve and then through the floor to the diffuser.

C The foot warmer control valves are individually cable
C controlled from the pilots instrument panel. The control
C knobs are located one at each side of the instrument panel,
C zone 210.

C B. Pressure Regulator Valve

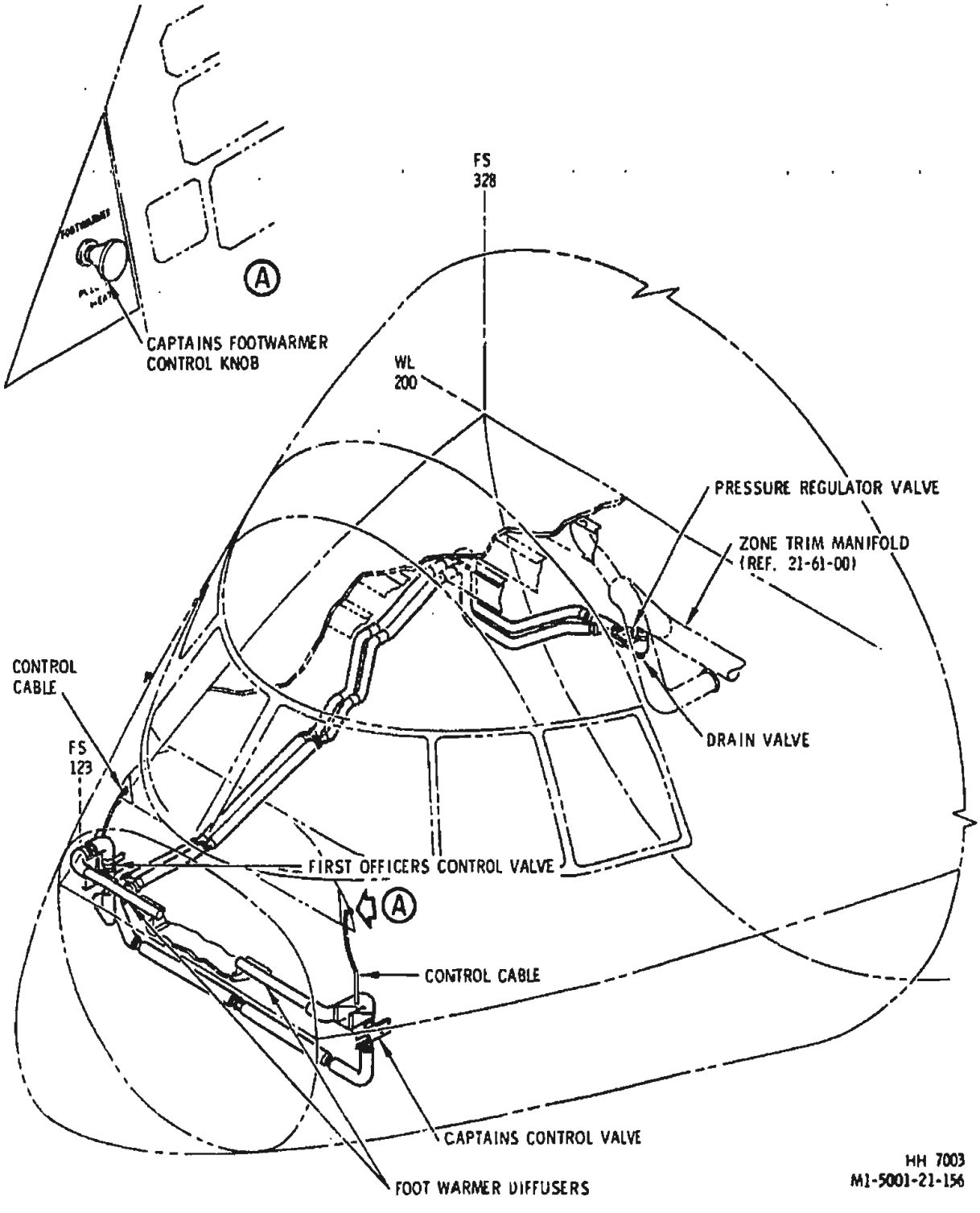
C The regulator valve (Ref. Fig. 4) is a 2-inch diameter
C pneumatically controlled and operated valve. The valve
C regulates incoming air at 40 psig and 280 degrees F to 3.0
C (± 0.5) psig with a flow of 7.0 pounds per minute. The
C valve will fail in the closed position.

C C. Control Valve

C The control valve (Ref. Fig. 5) is a 1-inch diameter, cable
C operated, shutoff valve. The valve controls the flow of hot
C air at 225 degrees F and 3 psig at 20 cfm. There are four
C detent positions: A closed, two partially open, and a fully
C open valve position.

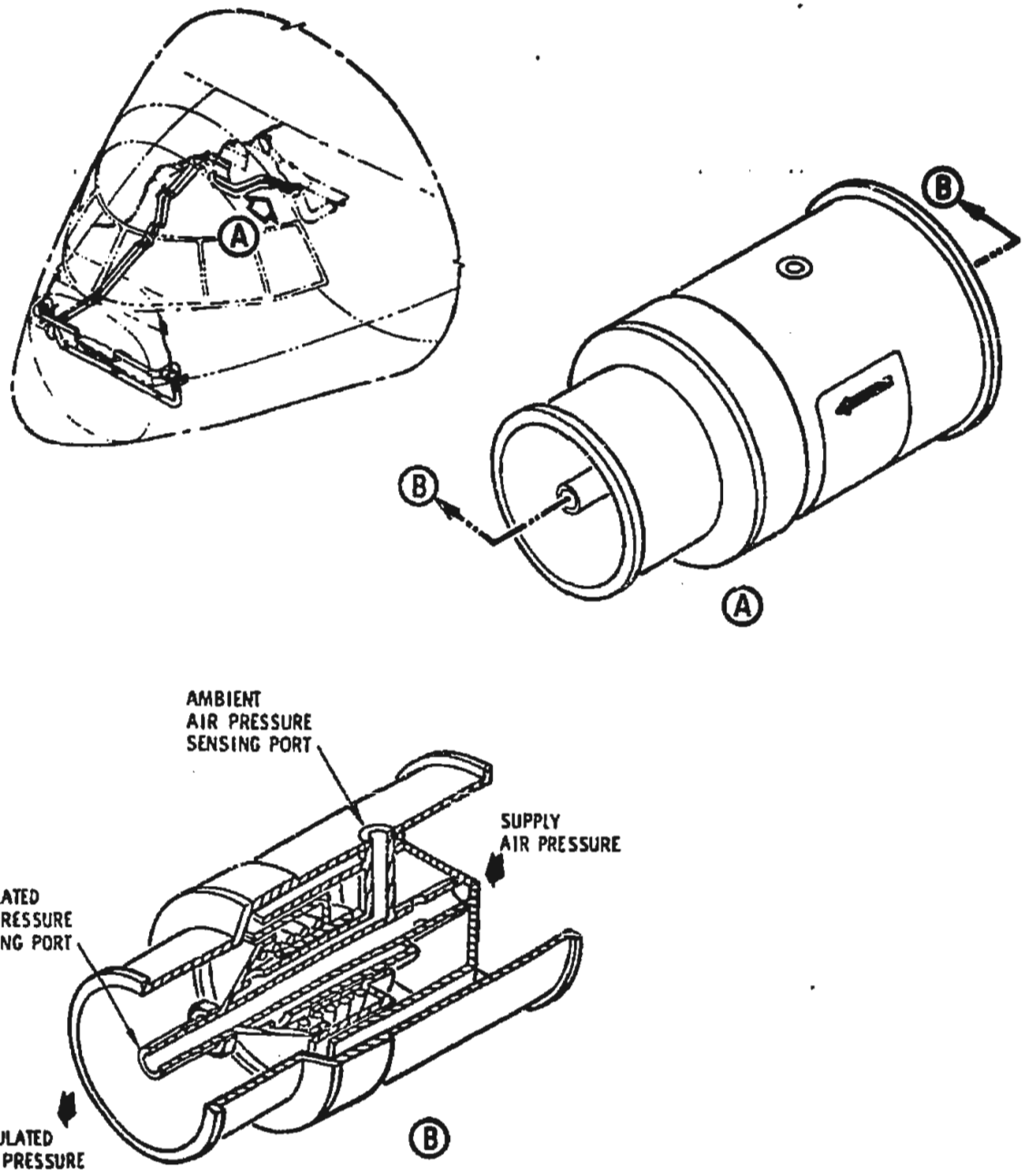
C D. Diffuser

CR The diffuser is a 24-inch long, 1-1/2 inch diameter aluminum
C pipe with two 6-inch long by 1/2-inch wide slots. The slots
C are shrouded with deflectors to direct the air in the proper
C direction.



CR
CR

Flight Station Pneumatic Foot Warmers
Figure 3



HH 7888
M1-5100-21-182

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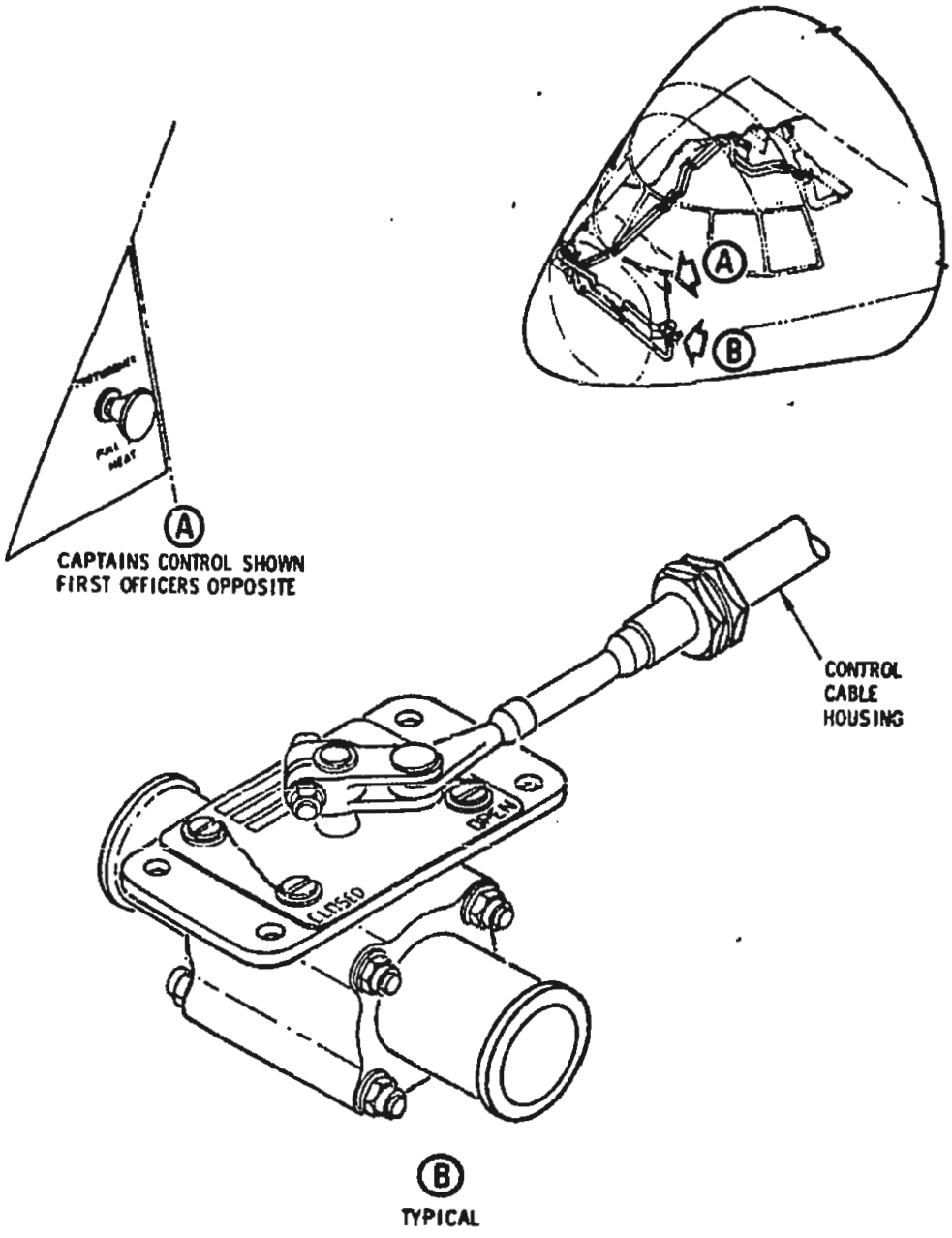
Foot Warmer Pressure Regulator Valve
Figure 4



HH 7887
M1-5100-21-183

CR
CR

Foot Warmer Control Valve
Figure 5

R EFFECTIVITY: 001-023
R
001B

R FOOT WARMER PRESSURE REGULATOR VALVE - REMOVAL AND INSTALLATION

R 1. General

R The foot warmer pressure regulator valve regulates the flow of
R hot air to the pilots foot warmers. The regulator valve is
R mounted on the forward side of the FS 328 canted bulkhead
R beneath the zone trim manifold, zone 113.

R 2. Equipment and Materials

R Preformed Packing, Hamilton Standard, PN 69494J904, or
R equivalent

R Protective caps

R Lock-wire, Fed Spec QQ-W-390, Cond A, 0.032-inch diameter, or
R equivalent

R 3. Referenced Procedure

R 20-21-01 Swaged Flexible Coupling - Removal and Installation

R 4. Removal/Installation

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM
R TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN
R REQUIRED.

R A. Removal

R (1) On CABIN TEMP CONTROL panel, zone 215, place both hot
R air manifold ISLN VALVE switchlights in the released
R (out) position and tag.

R (2) Open forward electronic access door 112AB.

R (3) Disconnect flexible couplings (Ref. 20-21-01) from
R inboard and outboard ends of regulator valve (Ref. Fig.
R 401).

R (4) Remove screw from valve mounting clamp, and remove
R regulator valve.

R (5) Install protective caps on open ducts.

R B. Installation

R (1) Ensure that switchlights tagged in Step 4A(1) are in
R the released (out) position and tagged.

R (2) Remove protective caps from open ducts.

R (3) Mount regulator valve loosely to structure using clamp
R (Ref. Fig. 401).

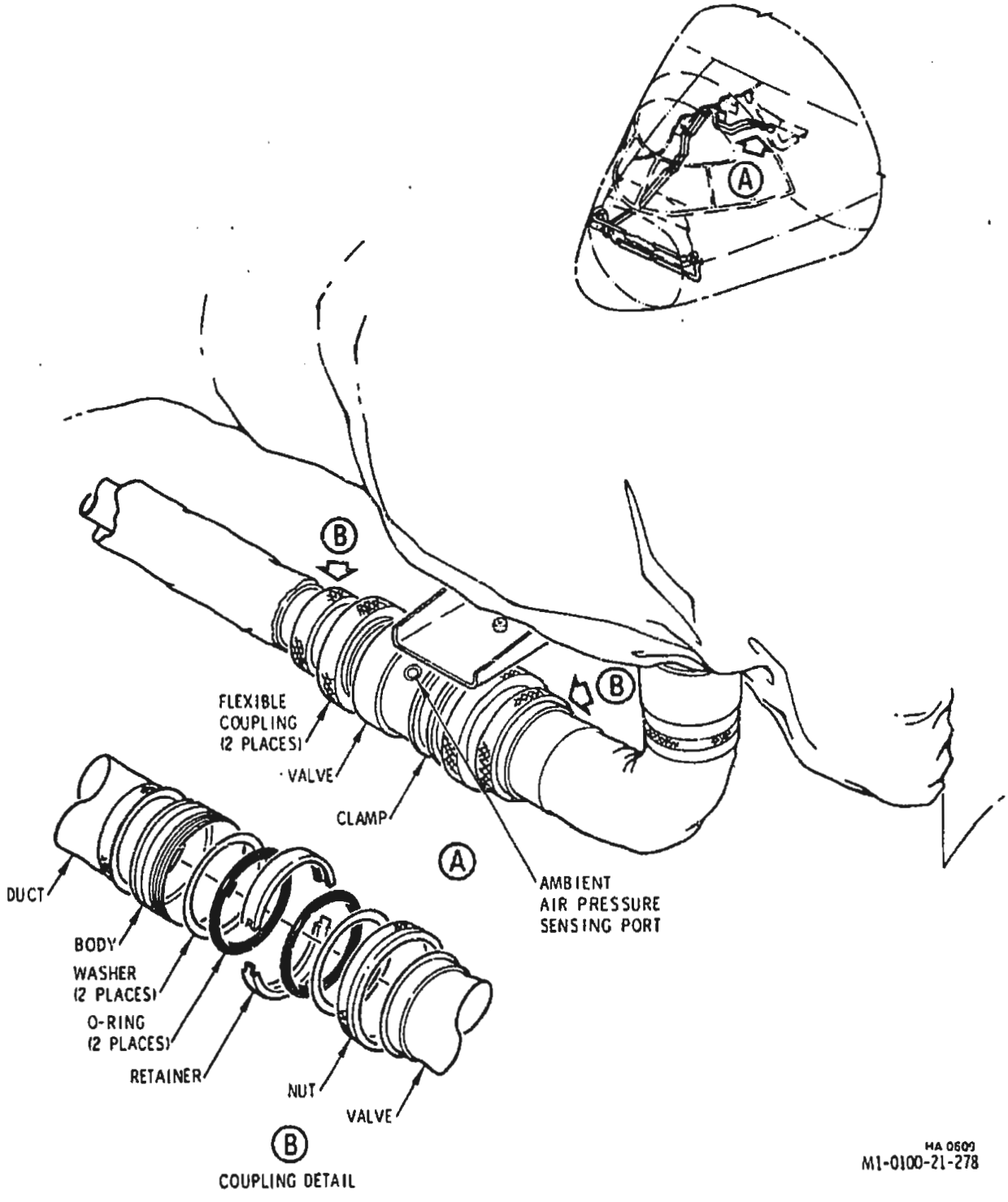
R CAUTION: ENSURE THAT REGULATOR VALVE IS PROPERLY
R POSITIONED. ARROWS ON BODY POINT TO RIGHT
R SIDE OF AIRCRAFT. ENSURE THAT MOUNTING CLAMP
R DOES NOT COVER AMBIENT AIR PRESSURE SENSING
R PORT.

R (4) Install new packings on flexible couplings and connect
R regulator valve (Ref. 20-21-01). Safety coupling with
R lock-wire.

R (5) Tighten regulator valve mounting clamp.

R (6) Close access door 112AB.

R (7) Remove tags installed in Step 4A(1).



R Foot Warmer Pressure Regulator Valve - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL

R FOOTWARMER CONTROL VALVE - REMOVAL AND INSTALLATION

R 1. General

R The footwarmer control valves control the flow of hot air to the
R pilots footwarmer diffusers. The control valves are located, on
R on each side of the aircraft at FS 136 just beneath the flight
R station floor panel, outboard and below the pilots rudder
R pedals, zone 113.

R 2. Equipment and Materials

R Preformed Packing, Hamilton Standard, PN 69494J904, or
R equivalent

R Protective caps

R Lock-wire, Fed Spec QQ-W-390, Cond A, 0.032-inch diameter or
R equivalent

R 3. Referenced Procedure

R 20-21-01 Swaged Flexible Coupling - Removal and Installation

R 4. Removal/Installation

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM
R TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN
R REQUIRED.

R A. Removal

R (1) On CABIN TEMP CONTROL panel, zone 215, place both hot
R air manifold ISLN VALVE switchlights in the released
R (out) position and tag.

R (2) Open forward electronic access door 112AB.

R (3) Disconnect flexible couplings (Ref. 20-21-01) from top
R and bottom of control valve (Ref. Fig. 401).

R (4) Remove mounting screws from plate which is attached to
R valve. Do not separate valve from mounting plate.

R (5) Carefully pull valve and plate inboard to provide
R access to clevis pin and cotter pin.

R (6) Remove cotter pin, washer and clevis pin.

R (7) Remove valve and mounting plate.

R (8) Install protective caps on open ducts.

R B. Installation

R (1) Ensure that switchlights tagged in Step 4A(1) are in
R the released (out) position and tagged.

R (2) Position valve so that words OPEN and CLOSED are on
R bottom of valve (Ref. Fig. 401).

R (3) Place valve in approximate position and connect control
R rod to valve actuator arm using clevis pin, washer, and
R cotter pin.

R (4) Remove protective caps from open ducts.

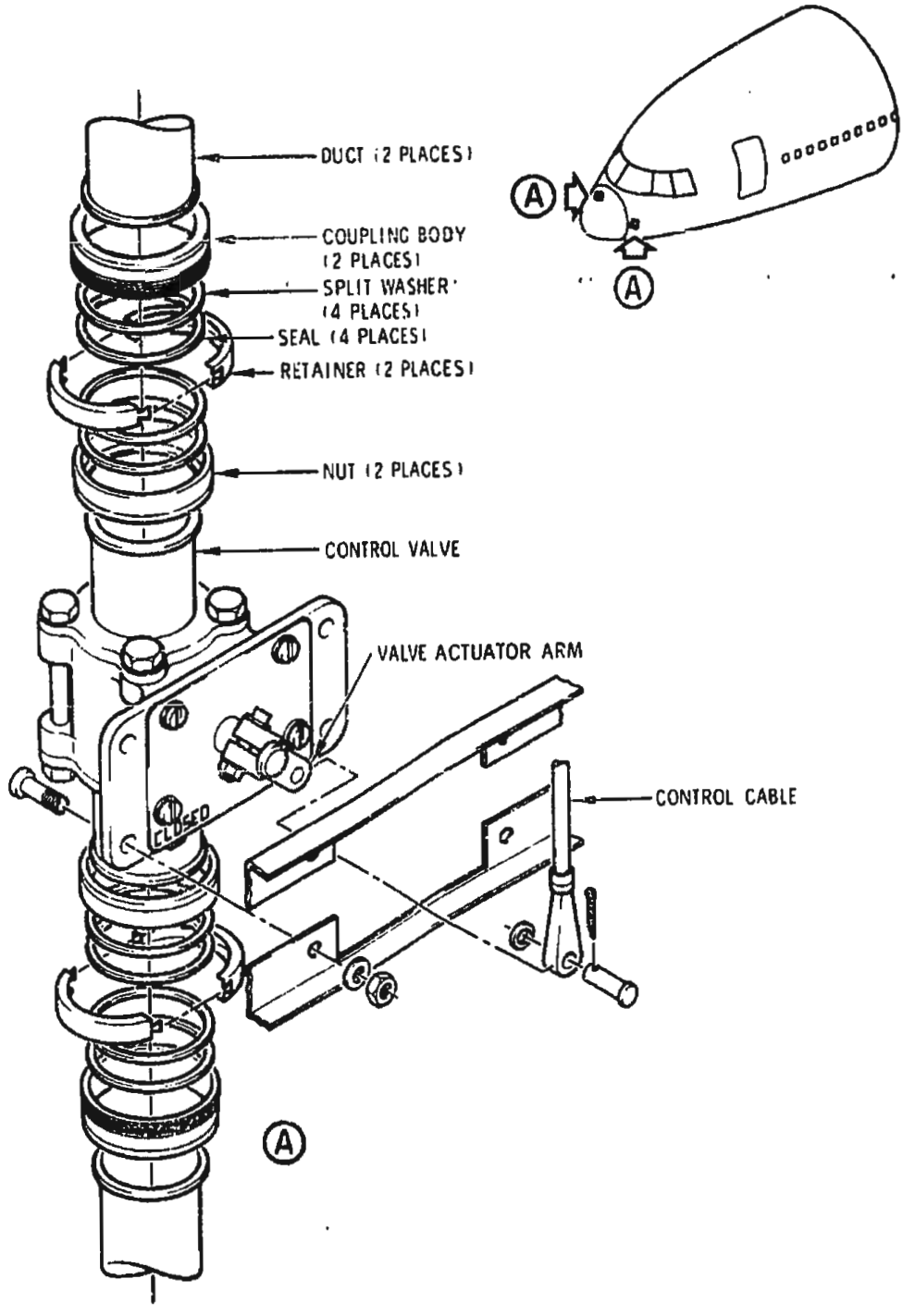
R (5) Carefully move valve and mounting plate outboard to
R proper position and install mounting screws.

R (6) Install new packing on flexible couplings and connect
R control valve (Ref. 20-21-01) safety with lock-wire.

R (7) Ensure that valve operates properly by observing valve
R position indicator with control in open and closed
R positions.

R (8) Remove tags installed in Step 4A(1).

R (9) Close forward electronic access door 112AB.



HA 0406
MI-0100-21-279

R Foot Warmer Control Valve - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

050

R # FOOTWARMER CONTROL VALVE - ADJUSTMENT AND TEST

R 1. General

R The footwarmer control valve is adjusted after the valve is
R installed in the aircraft. Testing of the valve consists of
R opening and closing the valve to verify control of hot air to
R the associated footwarmer.

R 2. Adjustment/Test

R A. Adjustment

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE
R WORN WHEN REQUIRED.

R (1) Ensure the valve control knob located outboard of the
R instrument panel in the flight station, zone 210, is
R pushed to the full in position.

R (2) Loosen the actuator arm on the valve shaft (Ref. Fig.
R 501).

R (3) Rotate the valve shaft until the position indicator is
R against the CLOSED position stop.

R (4) Tighten the actuator arm on the valve shaft.

R B. Test

R (1) Verify that the valve position indicator is in the
R CLOSED position when the control knob is in the full in
R position.

R (2) Verify that the valve position indicator is in the OPEN
R position when the control knoob is in the full out
R position.

CARGO HEAT SYSTEMS - DESCRIPTION AND OPERATION

1. General

The cargo heating systems (Ref. Fig. 1, 2, and 3) provide heat, as required, for each of the three cargo compartments to keep them within a set temperature range. All cargo heating systems are similar closed-loop, recirculation systems. Each system
R consists of an air recirculation fan, ducting, heat exchanger,
R thermal switches, and a control/indicator switchlight.

A. Compartment Air/Cargo Heat System Air Routing

The cargo heat system in each cargo compartment recirculates that cargo compartment air through a closed loop system including ducting, a recirculation fan, a heat exchanger with hot air ducting, and system control thermal switches.

In the forward cargo compartment the cargo heat system takes air from the compartment through two inlet openings in the right sidewall. Ducting from these openings takes the air below the compartment to the three-duct heat exchanger in the air cycle pack supply systems, then up to the discharge openings in the left sidewall (Ref. Fig. 1).

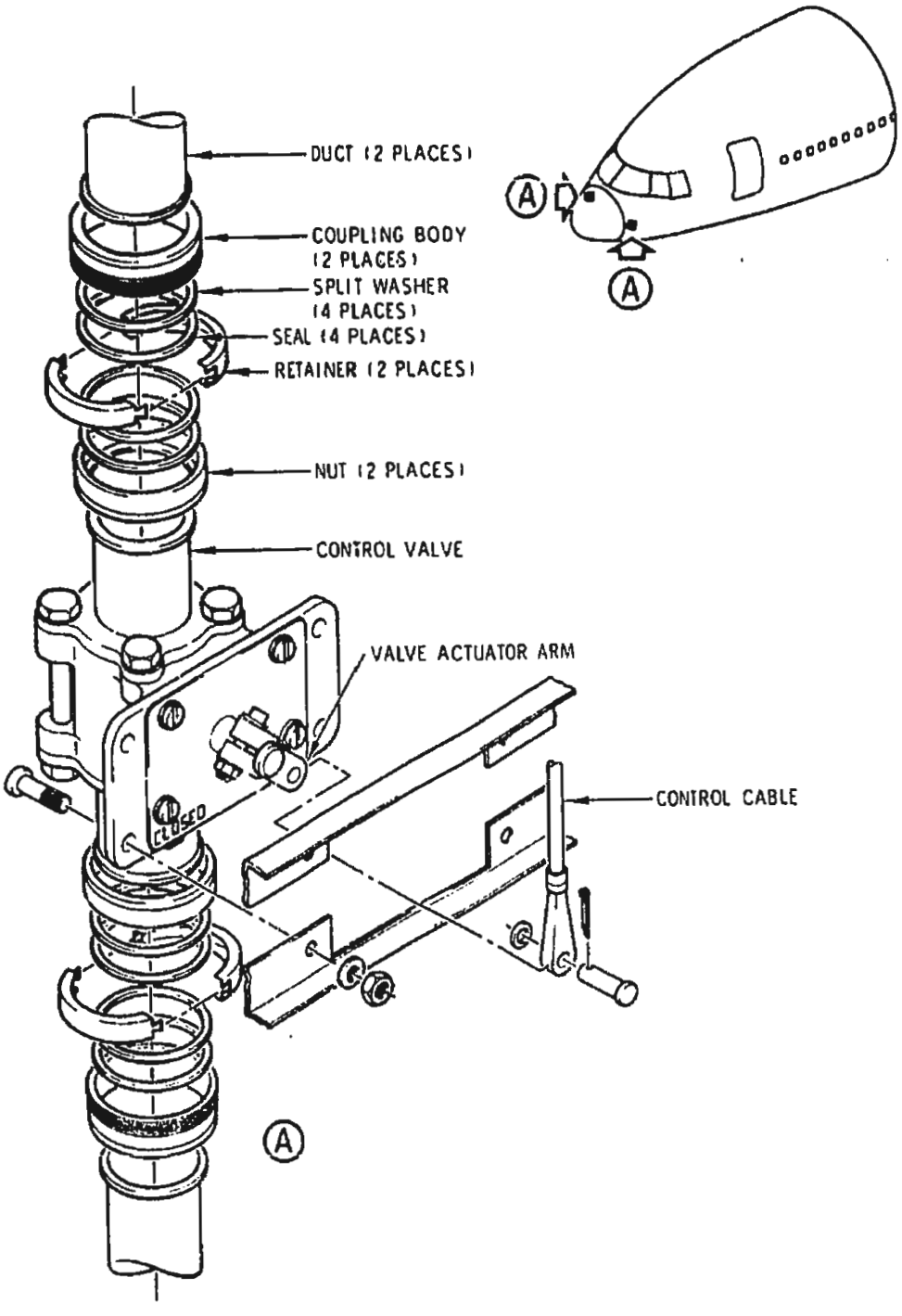
The mid cargo and aft cargo heat systems are similar to the forward cargo system except that the heat exchangers in these systems are in the No. 2 Engine/APU bleed air duct in the left cheek area, outboard of the compartments (Fig. 2 and 3).

B. Recirculation Fans

The air recirculation fan for each cargo compartment has a three-phase, 115V, 400 Hz motor driving an axial vane in-line fan. The fan forms part of the system air ducting. The forward cargo heat system fan is in the right cheek area, zone 122, the mid cargo fan is below the compartment floor, zone 154, and the aft cargo fan is in the right cheek area, zone 162.

C. Forward Heat Exchanger

The forward cargo compartment heat exchanger assembly is a three-section, muff-type air-to-air heat exchanger. The heat exchanger is located in the area below the center of the forward cargo compartment, zone 124. The heat exchanger consists of three 6-inch duct sections, one in each of the air cycle pack supply ducts. Each duct section has internal lengthwise fins parallel with the air cycle pack airflow.



HA 0406
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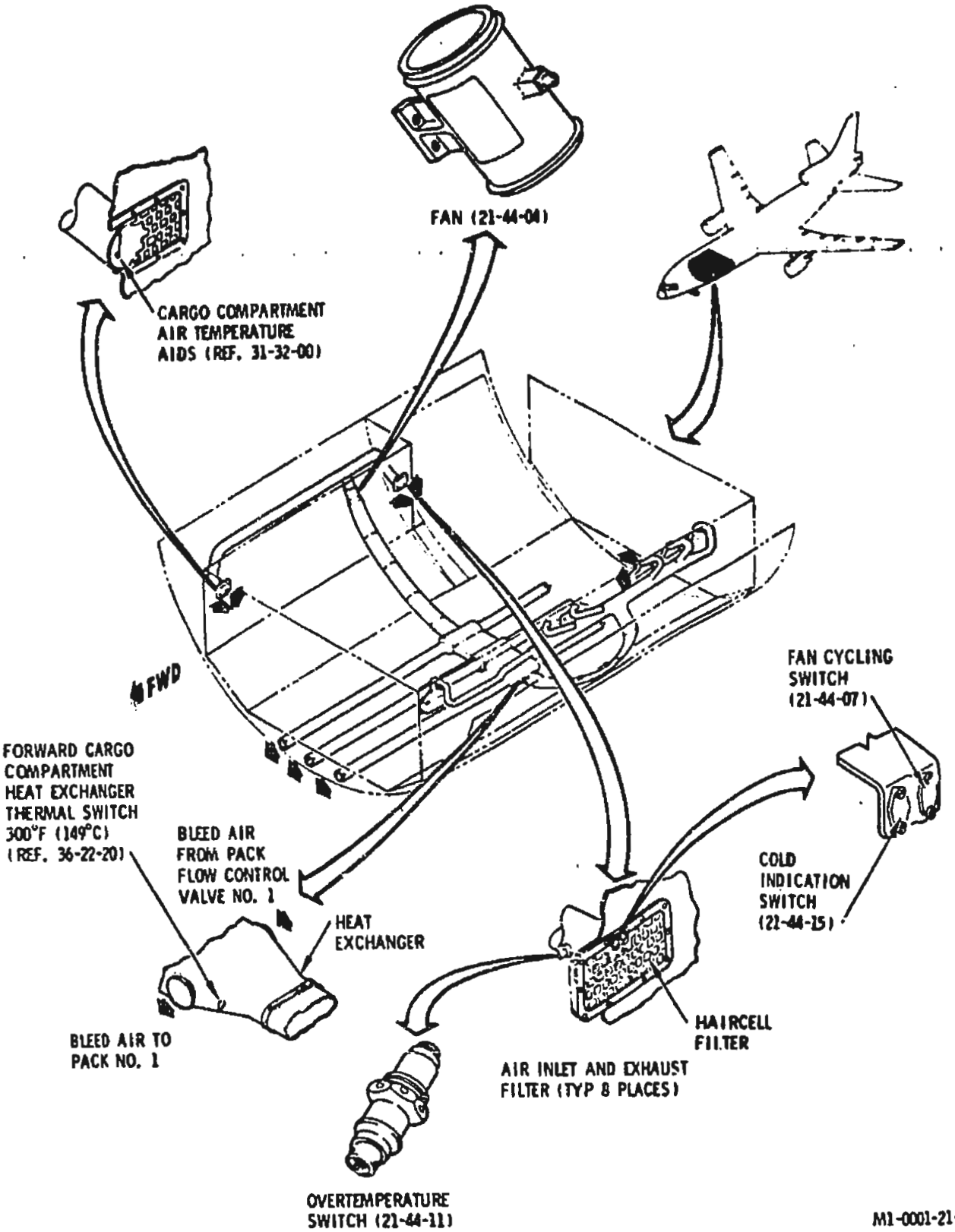
R Footwarmer Control Valve - Adjustment and Test
R Figure 501

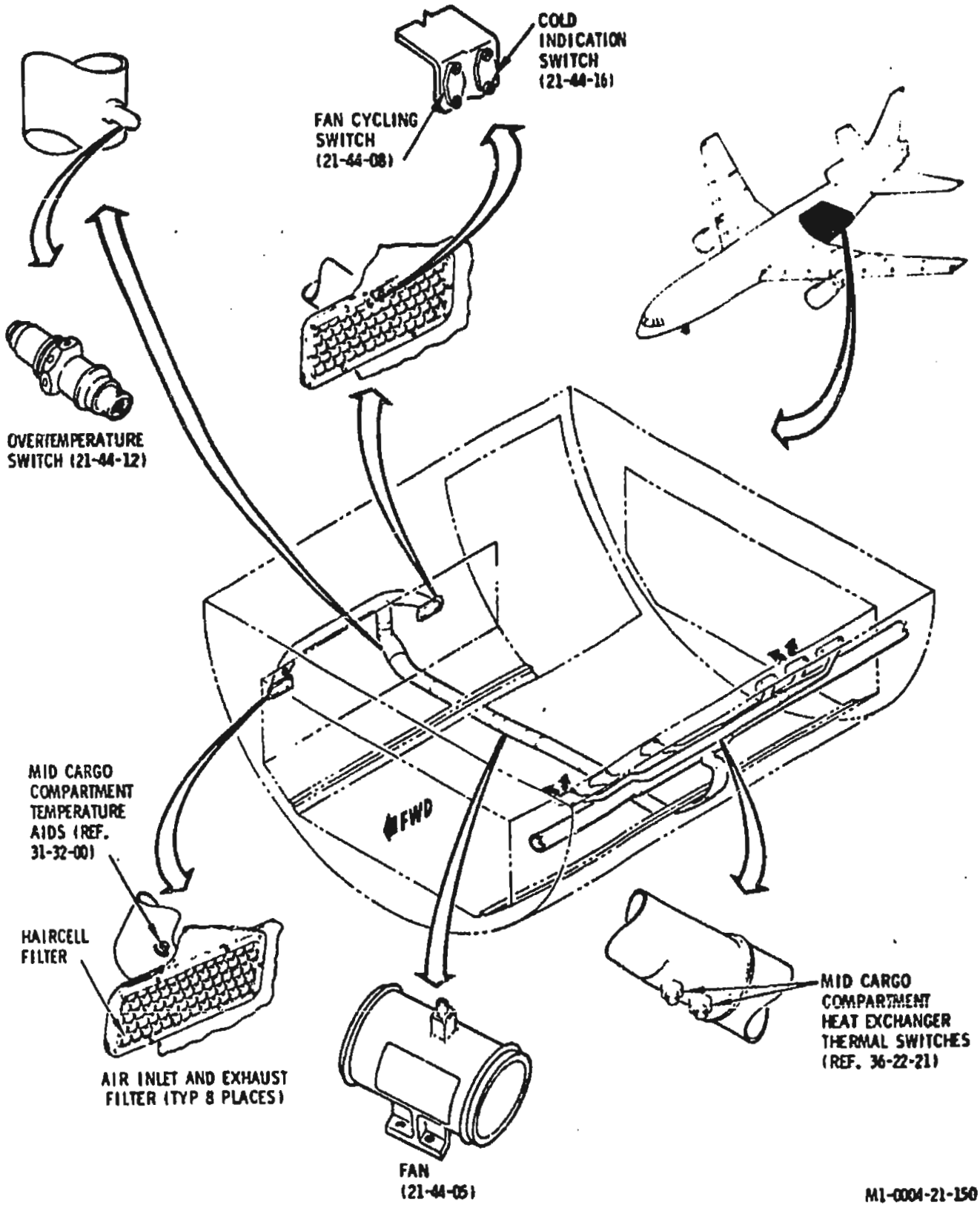

FAN (21-44-04)
CARGO COMPARTMENT AIR TEMPERATURE AIDS (REF. 31-32-00)
FWD
FAN CYCLING SWITCH (21-44-07)
FORWARD CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCH 300°F (149°C) (REF. 36-22-20)
BLEED AIR FROM PACK FLOW CONTROL VALVE NO. 1
HEAT EXCHANGER
COLD INDICATION SWITCH (21-44-15)
BLEED AIR TO PACK NO. 1
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
OVERTEMPERATURE SWITCH (21-44-11)
M1-0001-21-357

R
R

Forward Cargo Heat System
Figure 1

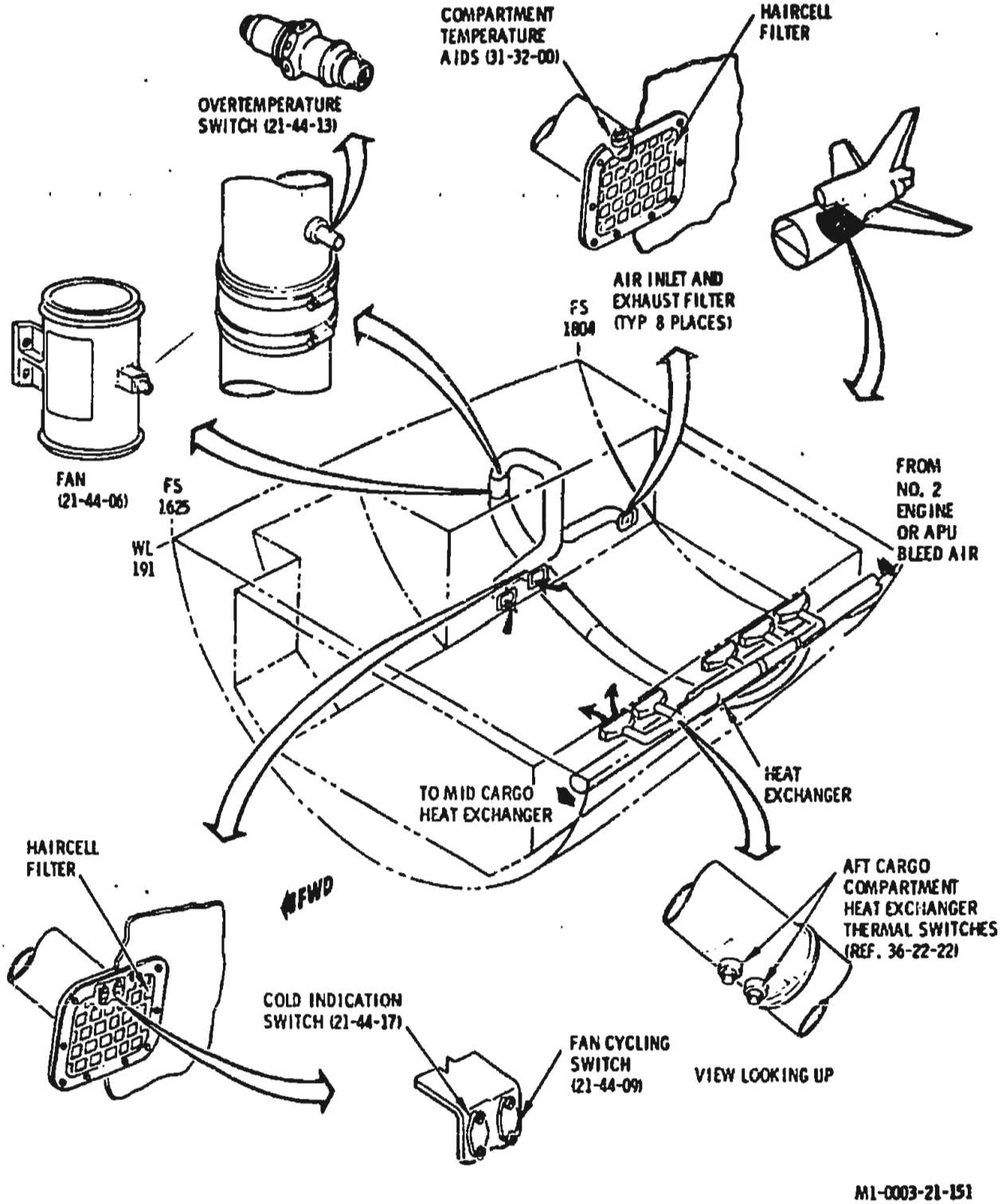
EFFECTIVITY: ALL

001B


COLD INDICATION SWITCH (21-44-16)
FAN CYCLING SWITCH (21-44-08)
OVERTEMPERATURE SWITCH (21-44-12)
FWD
MID CARGO COMPARTMENT TEMPERATURE AIDS (REF. 31-32-00)
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
FAN (21-44-05)
MID CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCHES (REF. 36-22-21)
M1-0004-21-150

R
R

Mid Cargo Heat System
Figure 2



R
R

Aft Cargo Heat System
Figure 3

EFFECTIVITY: ALL

001B

Each duct section also has external fins that are perpendicular to the air cycle pack airflow and parallel to the recirculating airflow. The three duct sections are enclosed in one shroud to form the heat exchanger assembly.

D. Mid and Aft Heat Exchangers

The mid and aft cargo compartment heat exchangers are similar in construction to each other but different in length. The mid cargo compartment heat exchanger is longer than the aft cargo compartment heat exchanger. Both heat exchangers are 8-inch inside diameter, single-section, muff-type air-to-air heat exchangers similar in construction to the forward cargo compartment three-section heat exchanger.

The heat exchangers are located in the left side compartment, zone 153, for the mid cargo compartment, and zone 163 for the aft cargo compartment.

E. Thermal Switches

In each cargo heat system indication and control is provided by compartment cold indication, fan cycling, and overtemperature switches. These switches are mounted in ducting drawing air from the compartment, to sense compartment air temperature.

In all aircraft, the cold indication and fan cycling switches are mounted together behind a grille on the right side of the compartment. In the forward and mid compartments the switches are behind the aft-most grille, and in the aft compartment behind the center grille. In the mid and aft cargo heat systems, the overtemperature switch is located in the duct upstream of each recirculation fan (mid compartment, zone 152, FS1471; aft compartment, zone 162, FS1771).

The forward cargo heat system overtemperature switch is mounted with the cold indication and fan cycling switches, behind the grille on the right side of the compartment.

Area overheat system heat exchanger thermal switches (Ref. 36-22-00) are installed as follows:

R Forward compartment, in the heat exchanger shroud; mid and aft compartments, in the duct downstream of each fan.

The area overheat heat exchanger thermal switches detect any hot bleed air leakage that occurs in the heat exchangers. A leak in the forward cargo compartment heat exchanger will light AREA OVHT channel A, B and C on Flight Engineer/Second

Officers ENGINE BLEED CONTROL panel. A leak in mid and aft cargo compartments will light AREA OVHT channel J on ENGINE BLEED CONTROL panel (Ref. 36-22-00).

F. Electrical Power

The forward and mid cargo compartment heating systems receive 28V dc from the dc bus No. 2 through the CARGO TEMP - FWD MID (W9) circuit breaker; the aft cargo compartment heating system receives 28V dc from dc bus No. 3 through the CARGO TEMP - AFT (W10) circuit breaker. Both circuit breakers are located on the Flight Engineer/Second officers panel CB3, zone 215.

The CARGO TEMP - FWD MID circuit breaker also supplies 28V dc to the indicator light control box (Ref. 33-17-00) to energize the pilots ECS caution light logic circuits.

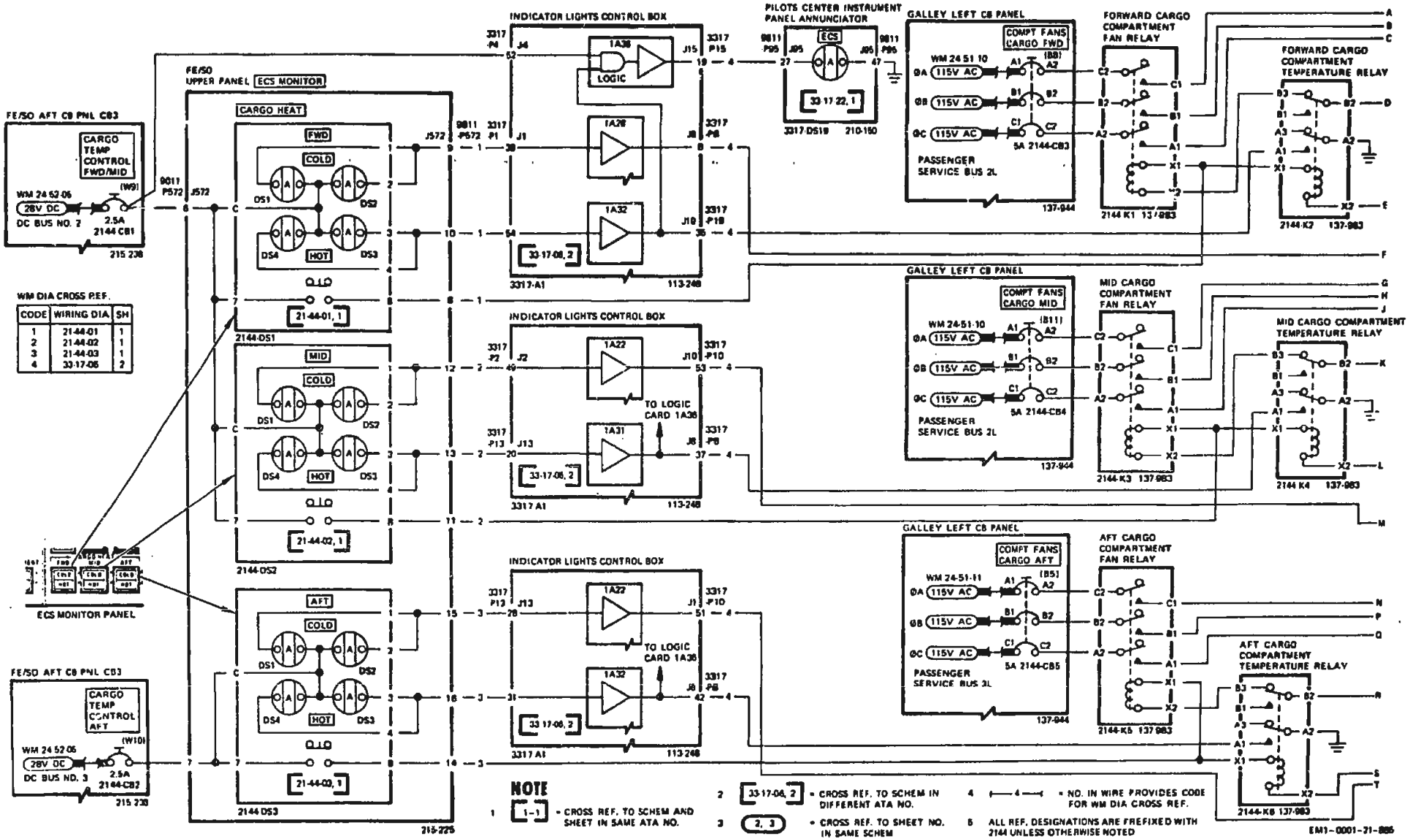
2. Operation

When the cargo compartment temperature (Ref. Fig. 4) is below 40 degrees F (4.4 degrees C), the cold indication switch turns on the COLD legend in the CARGO HEAT switchlight on the Flight Engineer/Second Officers ECS MONITOR panel.

When the applicable CARGO HEAT switchlight is depressed (latched in) with cargo compartment air temperature below 55 degrees F (13 degrees C) and the fan cycling switch closed, the fan control relay will be energized, turning on the fan. When compartment air temperature increases to 70 degrees F (21 degrees C), the fan cycling switch opens, turning the fan off. The fan will then cycle on and off to maintain cargo compartment air temperature between 55 and 70 degrees F (13 and 21 degrees C).

If a fan cycling switch malfunctions closed, and compartment air temperture rises above 95 degrees F (35 degrees C), the overtemperature switch closes, energizing the temperature control relay. When the relay closes, one set of contacts opens the circuit to deenergize the fan control relay and shut off the fan. The other set of relay contacts turns on the HOT legend in the CARGO HEAT switchlight. The system will then cycle in the overtemperature condition, between 80 and 95 degrees F, (27 and 35 degrees C) until the CARGO HEAT switchlight is released to the off position (out).

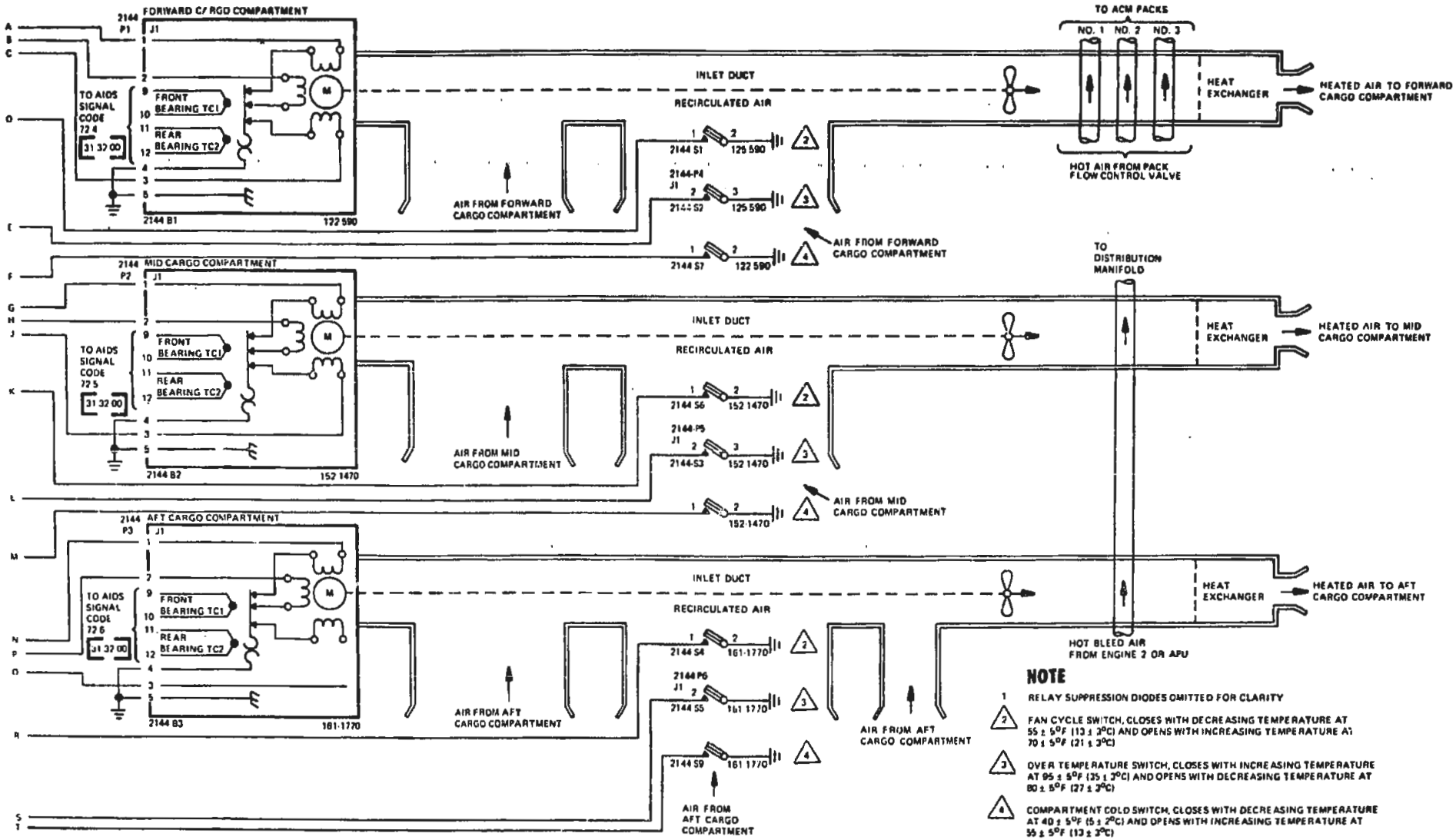
One heat exchanger thermal switch is installed in the forward heat exchanger, and two heat exchanger thermal switches are installed in each of the mid and aft heat exchanger ducts. These switches detect any failure of the bleed ducts inside the



R
R Cargo Heat System Control Schematic
Figure 4 (Sheet 1)

EFFECTIVITY: ALL

001B


FORWARD C/RGO COMPARTMENT
2144 P1
J1
TO AIDS SIGNAL CODE 724
31 32 00
FRONT BEARING TC1
REAR BEARING TC2
2144 B1
122 590
MID CARGO COMPARTMENT
2144 P2
TO AIDS SIGNAL CODE 725
2144 B2
152 1470
AFT CARGO COMPARTMENT
2144 P3
TO AIDS SIGNAL CODE 726
2144 B3
161-1770
TO ACM PACKS
NO. 1
NO. 2
NO. 3
INLET DUCT
RECIRCULATED AIR
HEAT EXCHANGER
HEATED AIR TO FORWARD CARGO COMPARTMENT
HEATED AIR TO MID CARGO COMPARTMENT
HEATED AIR TO AFT CARGO COMPARTMENT
HOT AIR FROM PACK FLOW CONTROL VALVE
TO DISTRIBUTION MANIFOLD
HOT BLEED AIR FROM ENGINE 2 OR APU
2144 S1
2144 S2
2144 S7
2144 S6
2144 S3
2144 S4
2144 S5
2144 S9
AIR FROM FORWARD CARGO COMPARTMENT
AIR FROM MID CARGO COMPARTMENT
AIR FROM AFT CARGO COMPARTMENT
AIR FROM AFT CARGO COMPARTMENT
NOTE
1 RELAY SUPPRESSION DIODES OMITTED FOR CLARITY
2 FAN CYCLE SWITCH, CLOSES WITH DECREASING TEMPERATURE AT 55 ± 5°F (13 ± 3°C) AND OPENS WITH INCREASING TEMPERATURE AT 70 ± 5°F (21 ± 3°C)
3 OVER TEMPERATURE SWITCH, CLOSES WITH INCREASING TEMPERATURE AT 95 ± 5°F (35 ± 3°C) AND OPENS WITH DECREASING TEMPERATURE AT 80 ± 5°F (27 ± 3°C)
4 COMPARTMENT COLD SWITCH, CLOSES WITH DECREASING TEMPERATURE AT 40 ± 5°F (5 ± 2°C) AND OPENS WITH INCREASING TEMPERATURE AT 55 ± 5°F (13 ± 3°C)
EM1-3002-21 836

R
R Cargo Heat System Control Schematic
Figure 4 (Sheet 2)

EFFECTIVITY: ALL

001B

shroud which is not covered by the area overheat detection system (Ref 36-22-00).

CARGO HEAT SYSTEM - FAULT ISOLATION

1. General

Reference data and fault isolation procedures from troubleshooting Cargo Heat system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify
R mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Cargo Heat system. It gives the area and access of each component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Fault Isolation/Identification

Table 101 is a list of all fault isolation data in this section of the manual.

TABLE 101

	FIGURE	TITLE
	101	Component Location Index
	102	Component Locator Diagram
R	103	CARGO HEAT HOT light stays on
R	104	CARGO HEAT COLD light stays on

COMPONENT	QTY	AREA/ACCESS	REFERENCE
BOX – INDICATOR LIGHTS CONTROL:			
ILCB CARD 1A22 (MID COLD/AFT COLD)	1	FESC/112AB	33-17-04
ILCB CARD 1A28 (FWD COLD)	1	FESC/112AB	33-17-04
ILCB CARD 1A31 (MID HOT)	1	FESC/112AB	33-17-04
ILCB CARD 1A32 (MID HOT/AFT HOT)	1	FESC/112AB	33-17-04
ILCB CARD 1A36 (ECS IND)	1	FESC/112AB	33-17-04
CIRCUIT BREAKERS:			
CARGO TEMP – CONTROL – FWD/MID 2144-CB1	1	FLT STA/CB3 (W9)	*
CARGO TEMP – CONTROL – AFT 2144-CB2	1	FLT STA/CB3 (W10)	*
COMPT FANS – CARGO – FWD 2144-CB3	1	GALLEY/LEFT CB PNL (B8)	*
COMPT FANS – CARGO – MID 2144-CB4	1	GALLEY/LEFT CB PNL (B11)	*
COMPT FANS – CARGO – AFT 2144-CB5	1	GALLEY/LEFT CB PNL (B14)	*
FAN – FORWARD CARGO COMPARTMENT 2144-B1	1	FWD CARGO, RT WALL/122BR	21-44-04
FAN – MID CARGO COMPARTMENT 2144-B2	1	MID CARGO, UNDER FLOOR/154HT	21-44-05
FAN – AFT CARGO COMPARTMENT 2144-B3	1	AFT CARGO, RT WALL/162FR	21-44-06
INDICATOR LIGHT – ECS 3317-DS19	1	FLT STA/PILOTS CTR INSTRUMENT PNL	33-17-99
RELAYS:			
FWD CARGO FAN CONTROL 2144-K1	1	MESC, AFT/192K, 192EA	*
FWD CARGO TEMP CONTROL 2144-K2	1	MESC, AFT/192K, 192EA	*
MID CARGO FAN CONTROL 2144-K3	1	MESC, AFT/192K, 192EA	*
MID CARGO TEMP CONTROL 2144-K4	1	MESC, AFT/192K, 192EA	*
AFT CARGO FAN CONTROL 2144-K5	1	MESC, AFT/192K, 192EA	*
AFT CARGO TEMP CONTROL 2144-K6	1	MESC, AFT/192K, 192EA	*
SWITCHES:			
COLD INDICATION (FWD) 2144-S7	1	FWD CARGO, BEHIND AFT RT GRILLE/122JR	21-44-15
COLD INDICATION (MID) 2144-S8	1	MID CARGO, BEHIND AFT RT GRILLE/152FR	21-44-16
COLD INDICATION (AFT) 2144-S9	1	AFT CARGO, BEHIND CTR RT GRILLE/162FR	21-44-17
FAN CYCLING (FWD) 2144-S1	1	FWD CARGO, BEHIND AFT RT GRILLE/122JR	21-44-07
FAN CYCLING (MID) 2144-S6	1	MID CARGO, BEHIND AFT RT GRILLE/152FR	21-44-08
FAN CYCLING (AFT) 2144-S4	1	AFT CARGO, BEHIND CTR RT GRILLE/162FR	21-44-09
OVERTEMPERATURE (FWD) 2144-S2	1	FWD CARGO, BEHIND RT SIDEWALL/122LR	21-44-11
OVERTEMPERATURE (MID) 2144-S3	1	MID CARGO, BEHIND RT SIDEWALL/152ER	21-44-12
OVERTEMPERATURE (AFT) 2144-S5	1	AFT CARGO, BEHIND RT SIDEWALL/162FR	21-44-13

*SEE WM EQUIPMENT LIST

M1-0000-21-1408

R
R

Component Location Index
Figure 101 (Sheet 1)

EFFECTIVITY: ALL

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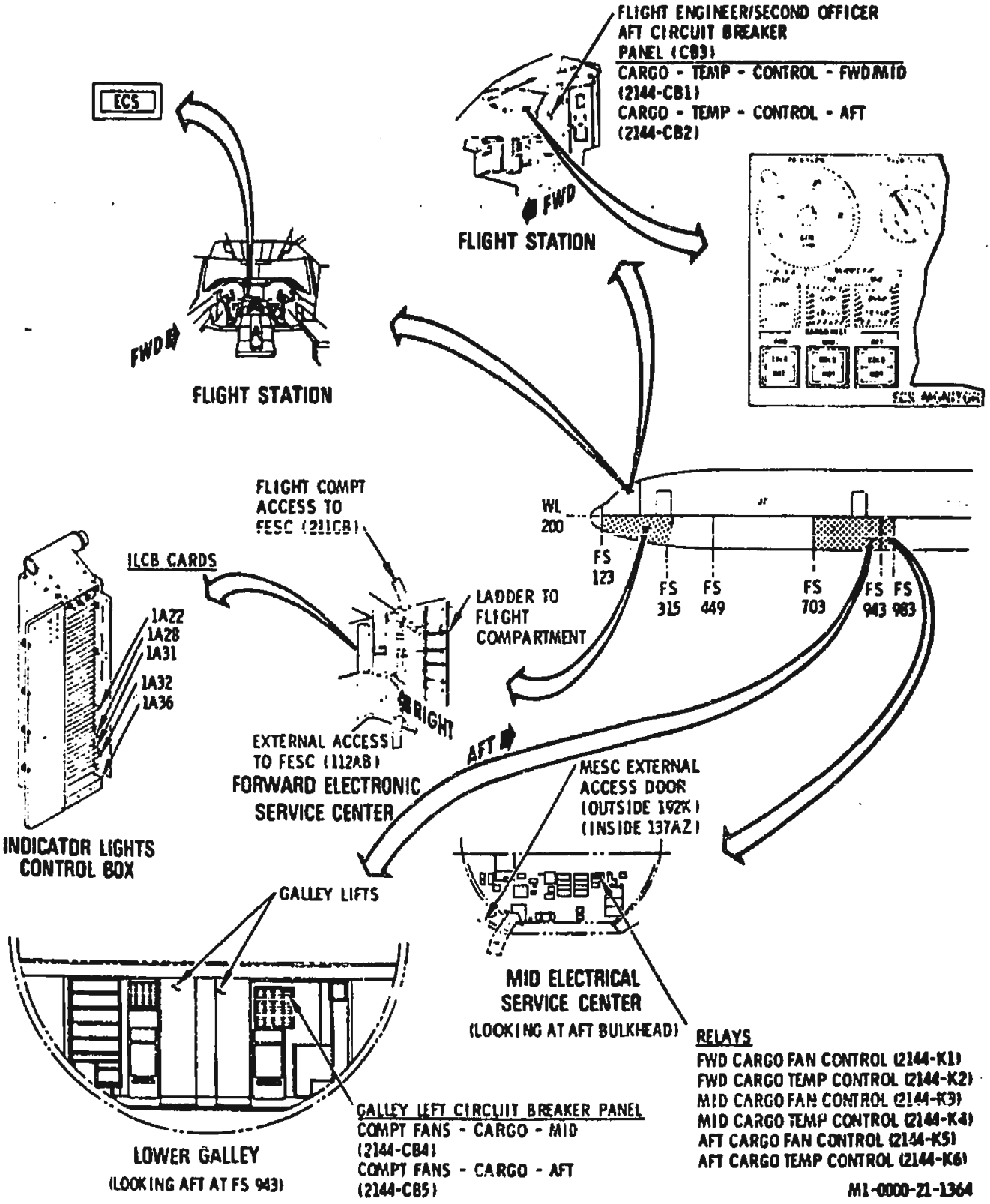
COMPONENT	QTY	AREA/ACCESS	REFERENCE
SWITCHLIGHTS:			
CARGO HEAT (FWD) 2144-DS1	1	FLT STA, FE/SO PNL/P11	20-33-01
CARGO HEAT (MID) 2144-DS2	1	FLT STA, FE/SO PNL/P11	20-33-01
CARGO HEAT (AFT) 2144-DS3	1	FLT STA, FE/SO PNL/P11	20-33-01

*SEE WIRING EQUIPMENT LIST

M1-0000-21-1514

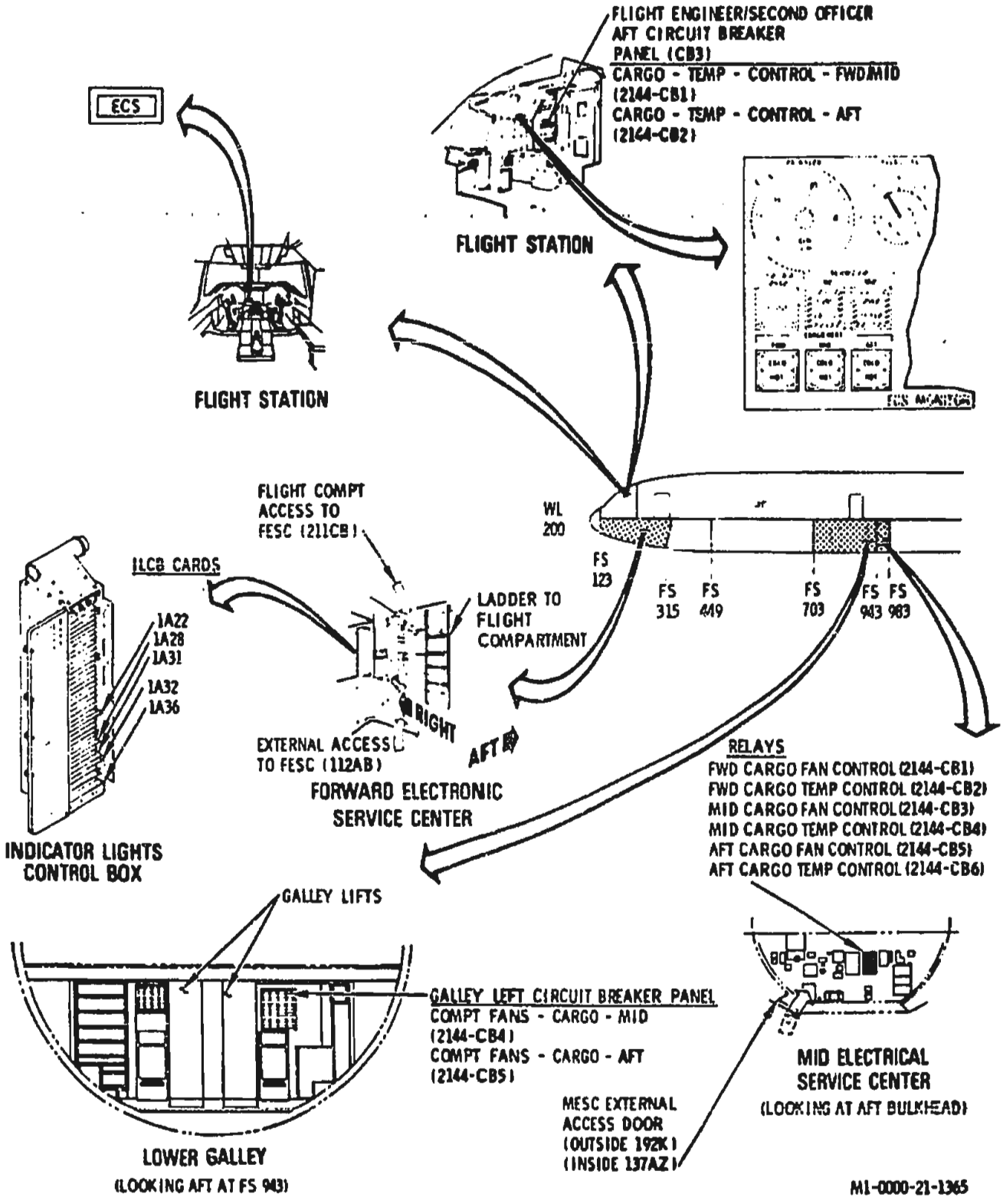


R
R

Component Locator Diagram
Figure 102 (Sheet 1)

EFFECTIVITY: 001-023

001B

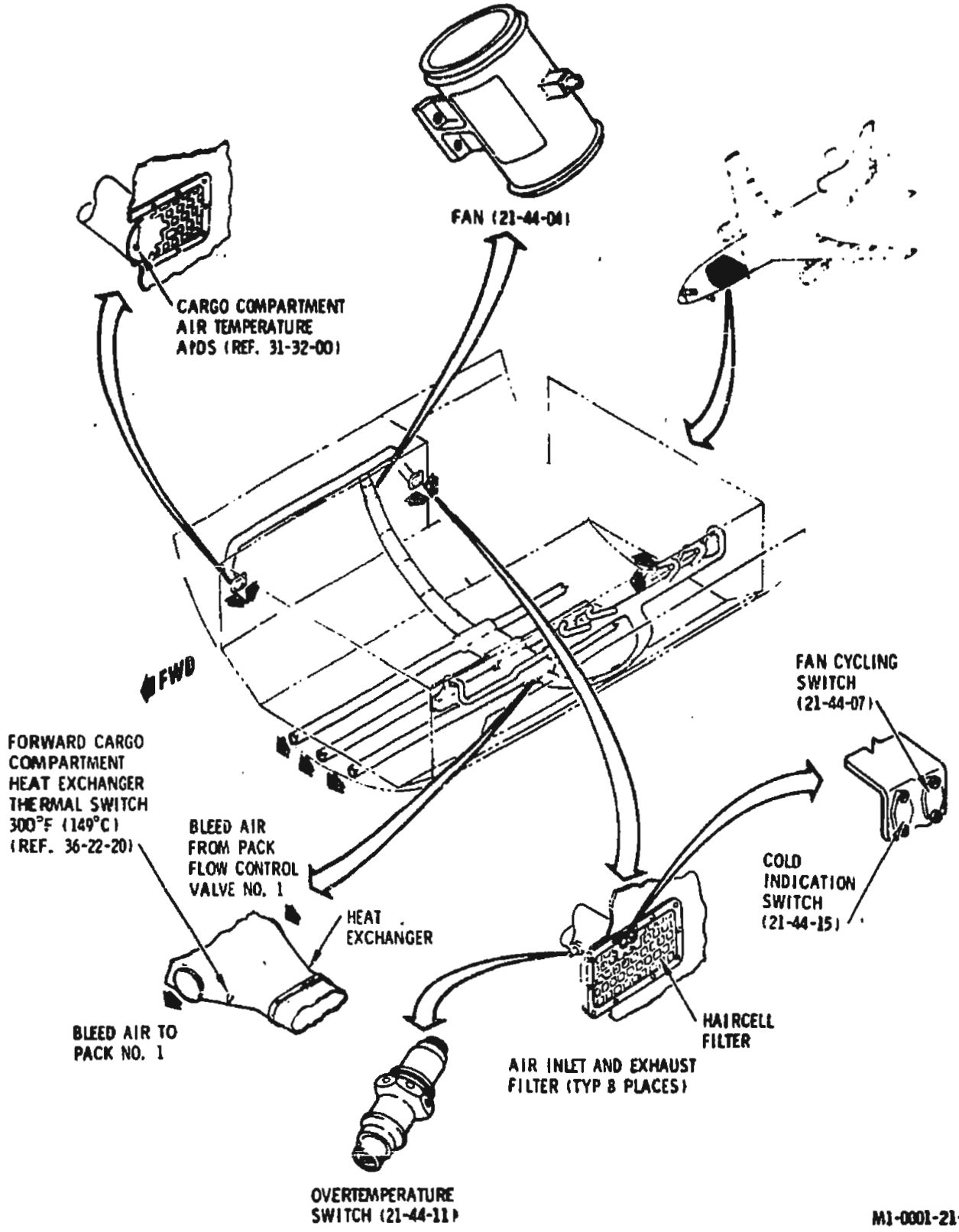


R
R

Component Locator Diagram
Figure 102 (Sheet 1)

EFFECTIVITY: 024-999

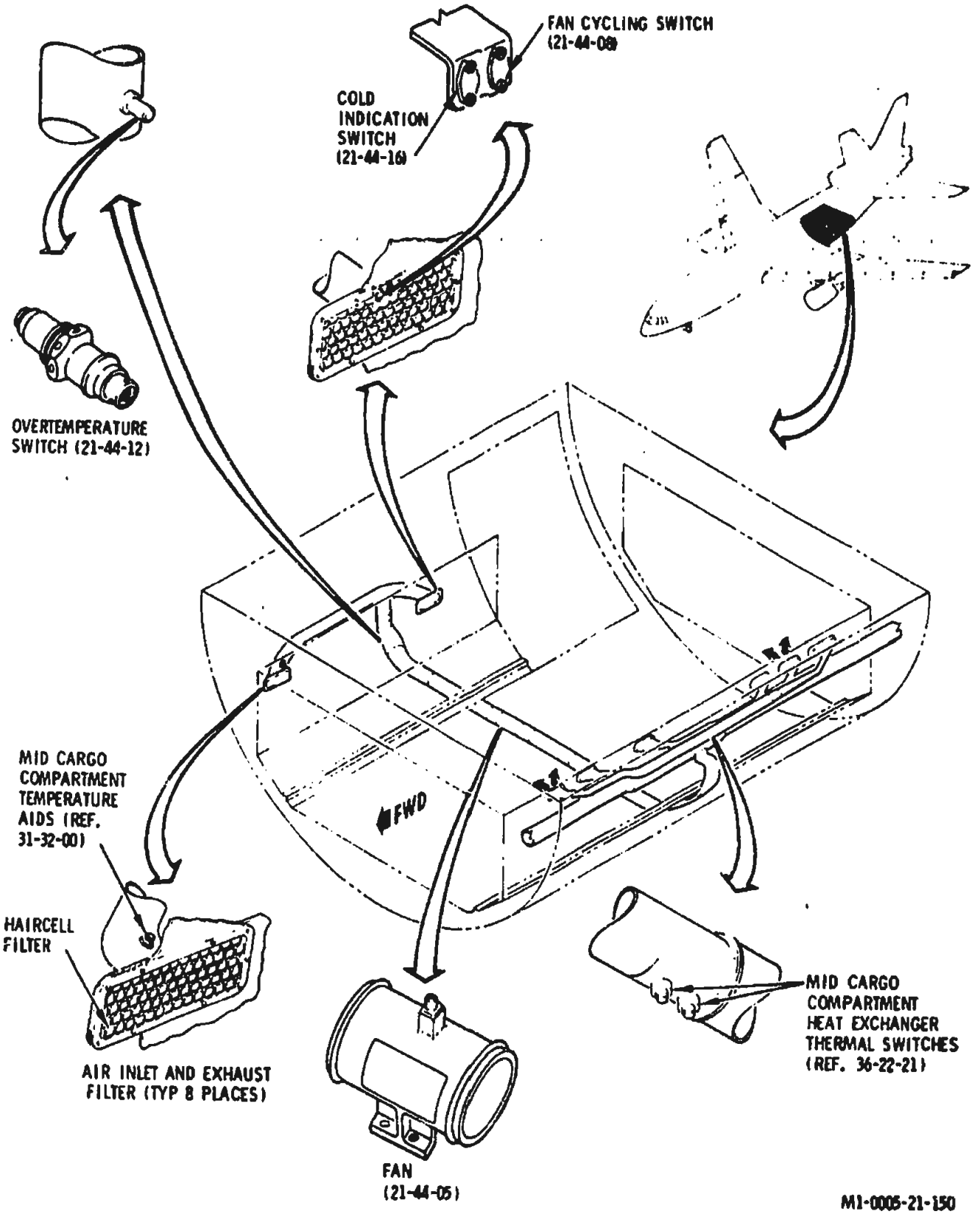
00 B


FAN (21-44-04)
CARGO COMPARTMENT AIR TEMPERATURE AIDS (REF. 31-32-00)
FWD
FORWARD CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCH 300°F (149°C) (REF. 36-22-20)
BLEED AIR FROM PACK FLOW CONTROL VALVE NO. 1
HEAT EXCHANGER
BLEED AIR TO PACK NO. 1
FAN CYCLING SWITCH (21-44-07)
COLD INDICATION SWITCH (21-44-15)
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
OVERTEMPERATURE SWITCH (21-44-11)

M1-0001-21-357

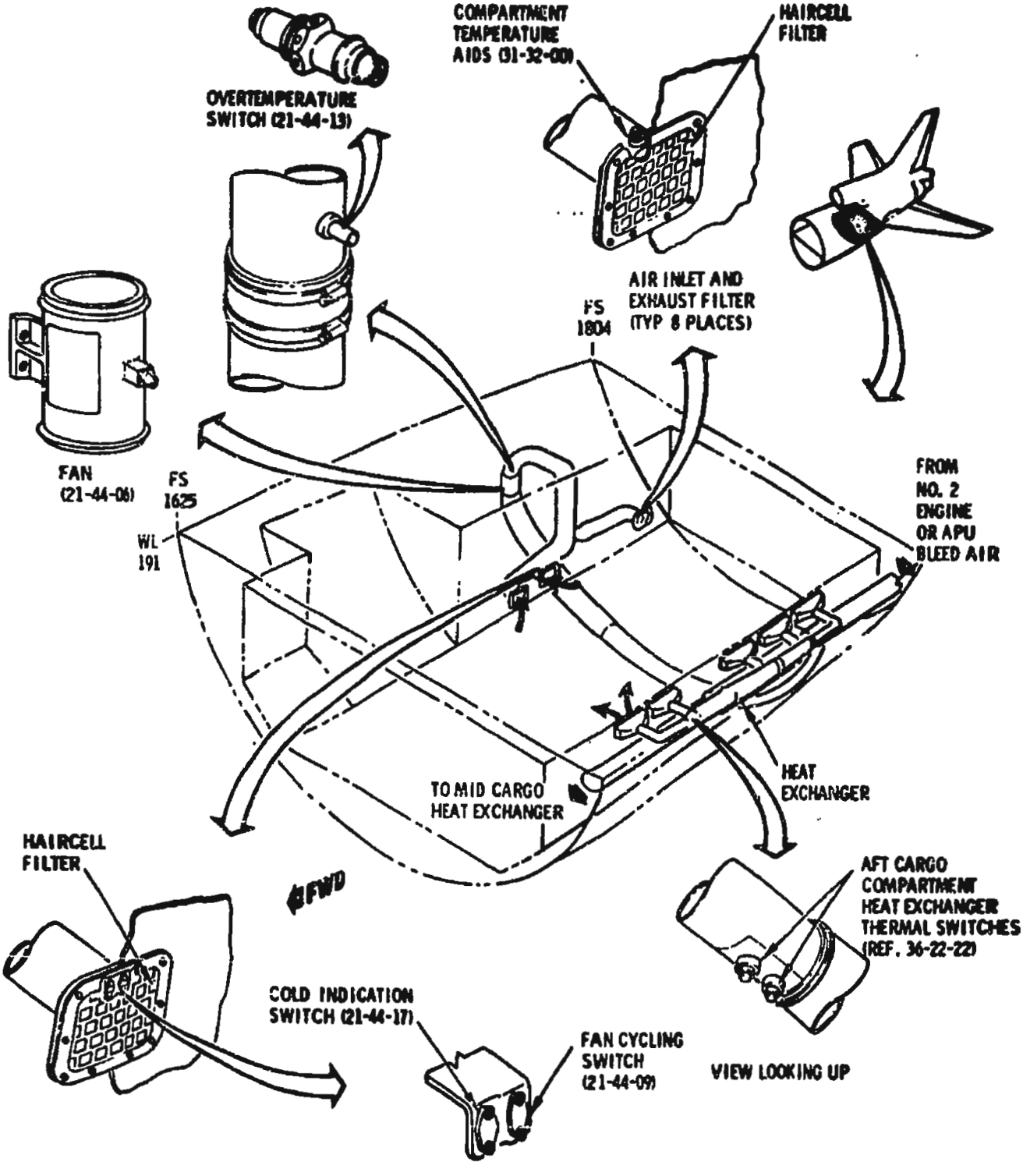
R Component Locator Diagram
R Forward Cargo Heat System
R Figure 102 (Sheet 2)

R EFFECTIVITY: ALL
R
001B


FAN CYCLING SWITCH (21-44-08)
COLD INDICATION SWITCH (21-44-16)
OVERTEMPERATURE SWITCH (21-44-12)
MID CARGO COMPARTMENT TEMPERATURE AIDS (REF. 31-32-00)
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
FWD
FAN (21-44-05)
MID CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCHES (REF. 36-22-21)

M1-0005-21-150

R Component Locator Diagram
R Mid Cargo Heat System
R Figure 102 (Sheet 3)

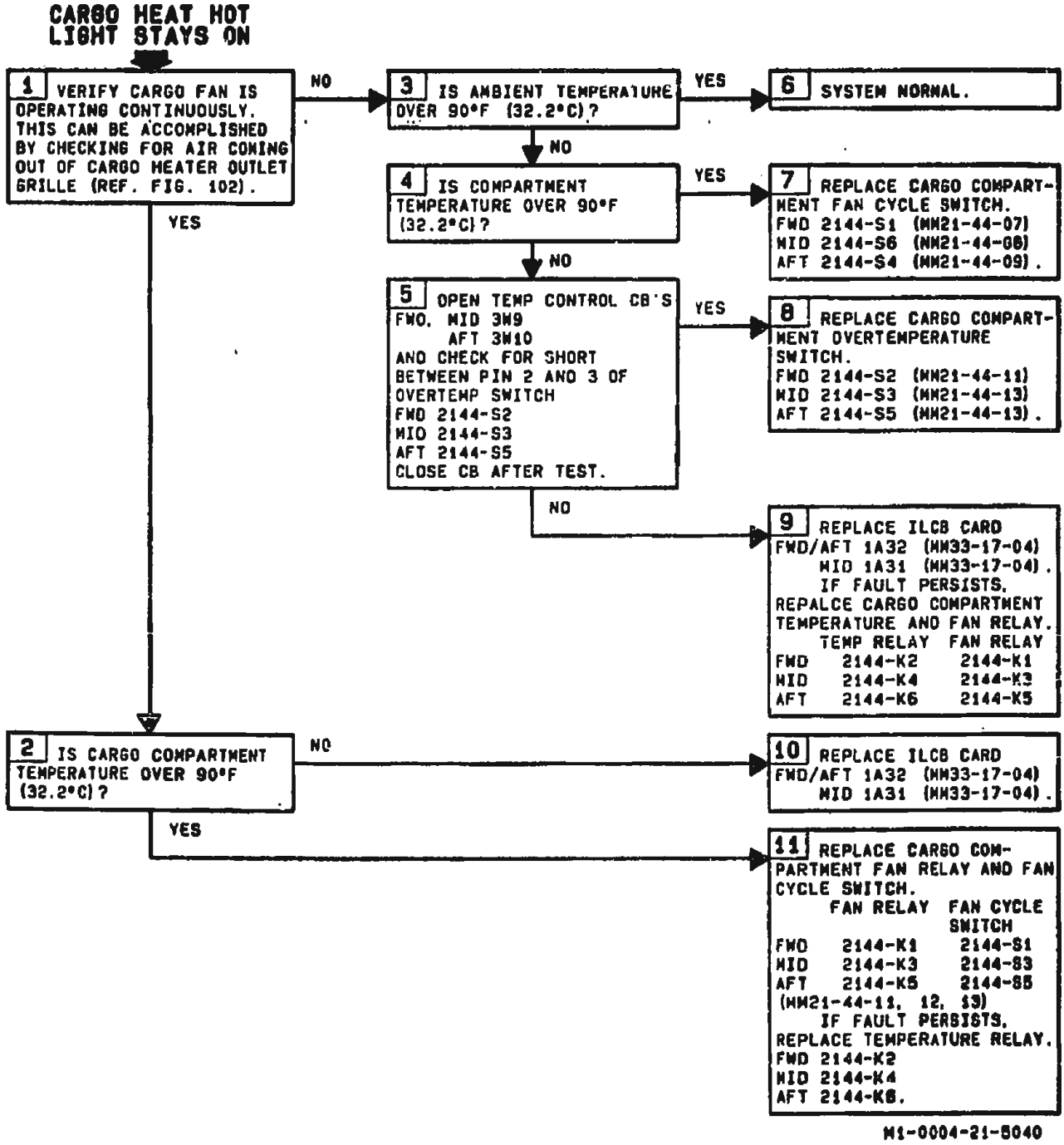


M1-0009-21-151

R Component Locator Diagram
R Aft Cargo Heat System
R Figure 102 (Sheet 4)

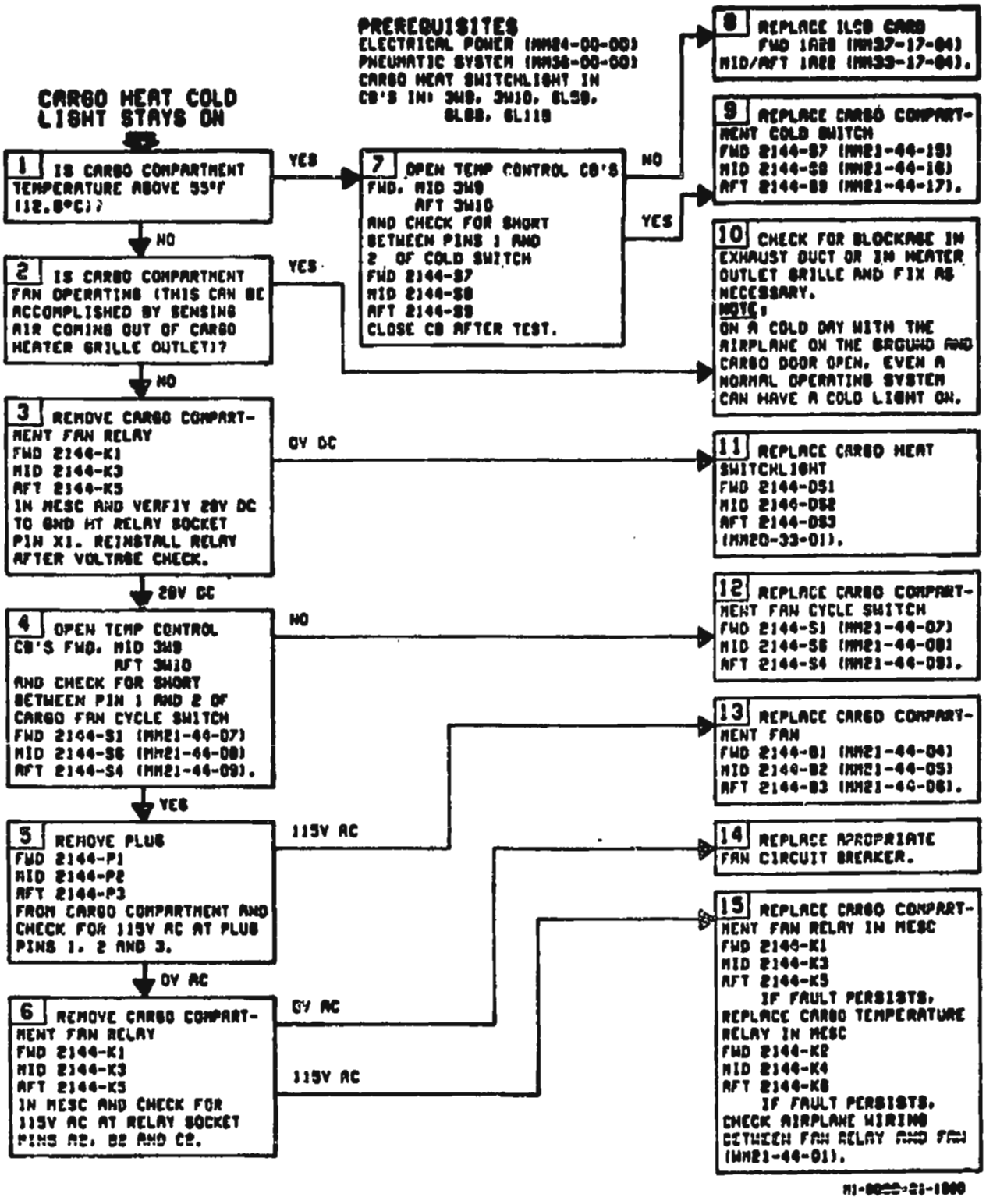
R EFFECTIVITY: ALL

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CARGO HEAT SWITCHLIGHT IN
CB'S IN: 3W8, 3W10, 6L5B, 6L8B, 6L11B

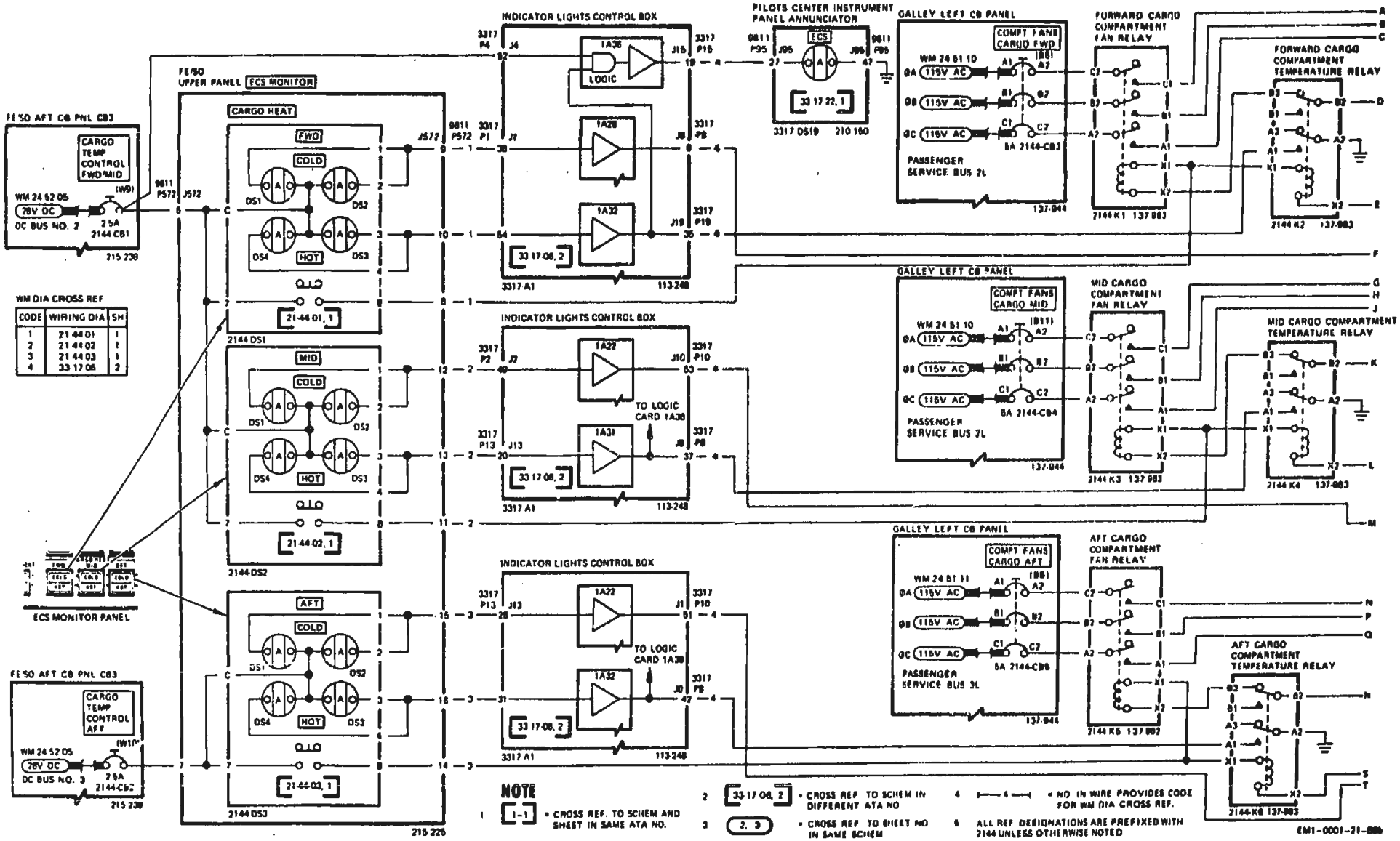

CARGO HEAT HOT LIGHT STAYS ON
1 VERIFY CARGO FAN IS OPERATING CONTINUOUSLY. THIS CAN BE ACCOMPLISHED BY CHECKING FOR AIR COMING OUT OF CARGO HEATER OUTLET GRILLE (REF. FIG. 102).
NO
YES
3 IS AMBIENT TEMPERATURE OVER 90°F (32.2°C)?
YES
6 SYSTEM NORMAL.
NO
4 IS COMPARTMENT TEMPERATURE OVER 90°F (32.2°C)?
YES
7 REPLACE CARGO COMPARTMENT FAN CYCLE SWITCH.
FWD 2144-S1 (MM21-44-07)
MID 2144-S6 (MM21-44-08)
AFT 2144-S4 (MM21-44-09).
NO
5 OPEN TEMP CONTROL CB'S FWD, MID 3W9
AFT 3W10
AND CHECK FOR SHORT BETWEEN PIN 2 AND 3 OF OVERTEMP SWITCH
FWD 2144-S2
MID 2144-S3
AFT 2144-S5
CLOSE CB AFTER TEST.
YES
8 REPLACE CARGO COMPARTMENT OVERTEMPERATURE SWITCH.
FWD 2144-S2 (MM21-44-11)
MID 2144-S3 (MM21-44-13)
AFT 2144-S5 (MM21-44-13).
NO
9 REPLACE ILCB CARD
FWD/AFT 1A32 (MM33-17-04)
MID 1A31 (MM33-17-04).
IF FAULT PERSISTS, REPALCE CARGO COMPARTMENT TEMPERATURE AND FAN RELAY.
TEMP RELAY FAN RELAY
FWD 2144-K2 2144-K1
MID 2144-K4 2144-K3
AFT 2144-K6 2144-K5
2 IS CARGO COMPARTMENT TEMPERATURE OVER 90°F (32.2°C)?
NO
10 REPLACE ILCB CARD
FWD/AFT 1A32 (MM33-17-04)
MID 1A31 (MM33-17-04).
YES
11 REPLACE CARGO COMPARTMENT FAN RELAY AND FAN CYCLE SWITCH.
FAN RELAY FAN CYCLE SWITCH
FWD 2144-K1 2144-S1
MID 2144-K3 2144-S3
AFT 2144-K5 2144-S5
(MM21-44-11, 12, 13)
IF FAULT PERSISTS, REPLACE TEMPERATURE RELAY.
FWD 2144-K2
MID 2144-K4
AFT 2144-K6.

M1-0004-21-5040

R Cargo Heat HOT Light Stays On
R Figure 103

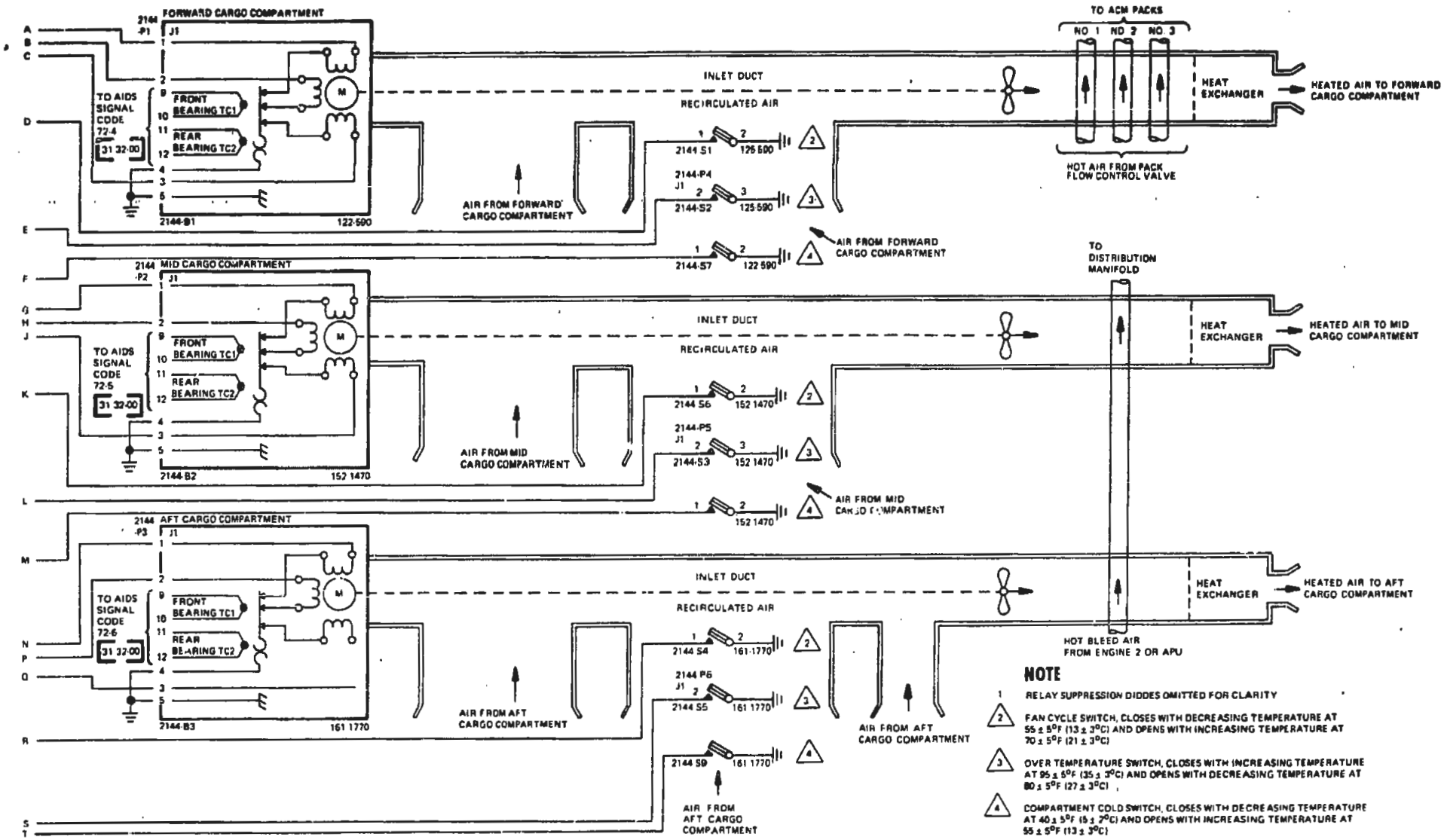

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC SYSTEM (MM36-00-00)
CARGO HEAT SWITCHLIGHT IN
CB'S IN: 3W9, 3W10, 6L9B,
6L8B, 6L11B
CARGO HEAT COLD
LIGHT STAYS ON
1 IS CARGO COMPARTMENT TEMPERATURE ABOVE 55°F (12.8°C)?
YES
NO
2 IS CARGO COMPARTMENT FAN OPERATING (THIS CAN BE ACCOMPLISHED BY SENSING AIR COMING OUT OF CARGO HEATER GRILLE OUTLET)?
YES
NO
3 REMOVE CARGO COMPARTMENT FAN RELAY
FWD 2144-K1
MID 2144-K3
AFT 2144-K5
IN MESC AND VERFIY 28V DC TO GND HT RELAY SOCKET PIN X1. REINSTALL RELAY AFTER VOLTAGE CHECK.
0V DC
28V DC
4 OPEN TEMP CONTROL CB'S FWD, MID 3W9
AFT 3W10
AND CHECK FOR SHORT BETWEEN PIN 1 AND 2 OF CARGO FAN CYCLE SWITCH
FWD 2144-S1 (MM21-44-07)
MID 2144-S6 (MM21-44-08)
AFT 2144-S4 (MM21-44-09).
NO
YES
5 REMOVE PLUG
FWD 2144-P1
MID 2144-P2
AFT 2144-P3
FROM CARGO COMPARTMENT AND CHECK FOR 115V AC AT PLUG PINS 1, 2 AND 3.
115V AC
0V AC
6 REMOVE CARGO COMPARTMENT FAN RELAY
FWD 2144-K1
MID 2144-K3
AFT 2144-K5
IN MESC AND CHECK FOR 115V AC AT RELAY SOCKET PINS A2, B2 AND C2.
0V AC
115V AC
7 OPEN TEMP CONTROL CB'S FWD, MID 3W9
AFT 3W10
AND CHECK FOR SHORT BETWEEN PINS 1 AND 2 OF COLD SWITCH
FWD 2144-S7
MID 2144-S8
AFT 2144-S9
CLOSE CB AFTER TEST.
NO
YES
8 REPLACE ILCB CARGO
FWD 1AB8 (MM37-17-04)
MID/AFT 1AB2 (MM33-17-04).
9 REPLACE CARGO COMPARTMENT COLD SWITCH
FWD 2144-S7 (MM21-44-15)
MID 2144-S8 (MM21-44-16)
AFT 2144-S9 (MM21-44-17).
10 CHECK FOR BLOCKAGE IN EXHAUST DUCT OR IN HEATER OUTLET GRILLE AND FIX AS NECESSARY.
NOTE:
ON A COLD DAY WITH THE AIRPLANE ON THE GROUND AND CARGO DOOR OPEN, EVEN A NORMAL OPERATING SYSTEM CAN HAVE A COLD LIGHT ON.
11 REPLACE CARGO HEAT SWITCHLIGHT
FWD 2144-DS1
MID 2144-DS2
AFT 2144-DS3
(MM20-33-01).
12 REPLACE CARGO COMPARTMENT FAN CYCLE SWITCH
FWD 2144-S1 (MM21-44-07)
MID 2144-S6 (MM21-44-08)
AFT 2144-S4 (MM21-44-09).
13 REPLACE CARGO COMPARTMENT FAN
FWD 2144-B1 (MM21-44-04)
MID 2144-B2 (MM21-44-05)
AFT 2144-B3 (MM21-44-06).
14 REPLACE APROPRIATE FAN CIRCUIT BREAKER.
15 REPLACE CARGO COMPARTMENT FAN RELAY IN MESC
FWD 2144-K1
MID 2144-K3
AFT 2144-K5
IF FAULT PERSISTS, REPLACE CARGO TEMPERATURE RELAY IN MESC
FWD 2144-K2
MID 2144-K4
AFT 2144-K6
IF FAULT PERSISTS, CHECK AIRPLANE WIRING BETWEEN FAN RELAY AND FAN (MM21-44-01).

Cargo Heat COLD Light Stays On
Figure 104


INDICATOR LIGHTS CONTROL BOX
PILOTS CENTER INSTRUMENT PANEL ANNUNCIATOR
GALLEY LEFT CB PANEL
FORWARD CARGO COMPARTMENT FAN RELAY
FORWARD CARGO COMPARTMENT TEMPERATURE RELAY
FE 50 UPPER PANEL ECS MONITOR
CARGO HEAT
FWD
COLD
HOT
MID
AFT
FE 50 AFT CB PNL CB3
CARGO TEMP CONTROL FWD/MID
CARGO TEMP CONTROL AFT
28V DC
DC BUS NO. 2
DC BUS NO. 3
2144 DS1
2144 DS2
2144 DS3
ECS MONITOR PANEL
WM DIA CROSS REF
CODE | WIRING DIA | SH
1 | 21 44 01 | 1
2 | 21 44 02 | 1
3 | 21 44 03 | 1
4 | 33 17 06 | 2
COMPT FANS CARGO FWD
COMPT FANS CARGO MID
COMPT FANS CARGO AFT
PASSENGER SERVICE BUS 2L
PASSENGER SERVICE BUS 3L
MID CARGO COMPARTMENT FAN RELAY
MID CARGO COMPARTMENT TEMPERATURE RELAY
AFT CARGO COMPARTMENT FAN RELAY
AFT CARGO COMPARTMENT TEMPERATURE RELAY
TO LOGIC CARD 1A36
NOTE
1 1-1 • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 33 17 06, 2 • CROSS REF TO SCHEM IN DIFFERENT ATA NO
3 2, 3 • CROSS REF TO SHEET NO IN SAME SCHEM
4 • NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 ALL REF DESIGNATIONS ARE PREFIXED WITH 2144 UNLESS OTHERWISE NOTED

Cargo Heat System Control Schematic
SCHEM 1 (Sheet 1)

R EFFECTIVITY: ALL
R
0018


FORWARD CARGO COMPARTMENT
2144 -P1
J1
TO AIDS SIGNAL CODE 72-4
31 32-00
FRONT BEARING TC1
REAR BEARING TC2
2144-B1
122-590
MID CARGO COMPARTMENT
2144 -P2
TO AIDS SIGNAL CODE 72-5
2144-B2
152 1470
AFT CARGO COMPARTMENT
2144 -P3
TO AIDS SIGNAL CODE 72-6
2144-B3
161 1770
INLET DUCT
RECIRCULATED AIR
AIR FROM FORWARD CARGO COMPARTMENT
AIR FROM MID CARGO COMPARTMENT
AIR FROM AFT CARGO COMPARTMENT
2144 S1
2144-P4
J1
2144-S2
2144-S7
2144 S6
2144-P5
2144-S3
2144 S4
2144 P6
2144 S5
2144 S9
TO ACM PACKS
NO 1
NO 2
NO 3
HOT AIR FROM PACK FLOW CONTROL VALVE
HEAT EXCHANGER
HEATED AIR TO FORWARD CARGO COMPARTMENT
TO DISTRIBUTION MANIFOLD
HEATED AIR TO MID CARGO COMPARTMENT
HEATED AIR TO AFT CARGO COMPARTMENT
HOT BLEED AIR FROM ENGINE 2 OR APU
NOTE
1 RELAY SUPPRESSION DIODES OMITTED FOR CLARITY
2 FAN CYCLE SWITCH, CLOSES WITH DECREASING TEMPERATURE AT 55 ± 5°F (13 ± 3°C) AND OPENS WITH INCREASING TEMPERATURE AT 70 ± 5°F (21 ± 3°C)
3 OVER TEMPERATURE SWITCH, CLOSES WITH INCREASING TEMPERATURE AT 95 ± 5°F (35 ± 3°C) AND OPENS WITH DECREASING TEMPERATURE AT 80 ± 5°F (27 ± 3°C)
4 COMPARTMENT COLD SWITCH, CLOSES WITH DECREASING TEMPERATURE AT 40 ± 5°F (5 ± 3°C) AND OPENS WITH INCREASING TEMPERATURE AT 55 ± 5°F (13 ± 3°C)
EM1-0002-21-886

Cargo Heat System Control Schematic
SCHEM 1 (Sheet 2)

R
R
0018 EFFECTIVITY: ALL

CARGO HEAT SYSTEM - ADJUSTMENT AND TEST

1. General

No adjustments are required for any component in the three cargo heat systems.

The following procedure provides a functional test of circuits and components, including a go, no-go test to verify thermal switches are operating within acceptable limits. For accurate determination of switch operating temperatures it will be necessary to remove the switches for overhaul shop testing. If this functional test is not completed successfully, refer to system fault isolation (Ref. 21-44-00) and replace faulty component or repair wiring as necessary.

2. Equipment and Materials

Heat gun, HG751, Master Appliance Corporation, or equivalent

Aerosol can of Freon, commercial grade, or equivalent

3. Referenced Procedures

21-44-00	Cargo Heat System - Fault Isolation
23-43-00	Service Interphone System - Maintenance Practices
24-00-00	Electrical Power - Maintenance Practices
33-17-00	Annunciator System - Adjustment and Test

4. Adjustment/Test

A. Functional Test (Cold Indication Switch and Fan Cycling Switch)

Functional test procedures for the three cargo heat systems are the same except for component locations (Ref. Figs. 501, 502 and 503). forward and mid cargo heat systems are the same except for component locations (Ref. Figs. 501 and 502).

(1) On the following circuit breaker panels, verify the listed circuit breakers are closed:

(a) Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215:

CARGO TEMP - FWD - MID (W9)

CARGO TEMP - AFT (W10)

(b) Galley left circuit breaker panel, zone 137:

COMPT FANS - CARGO - FWD (B8)

COMPT FANS - CARGO - MID (B11)

COMPT FANS - CARGO - AFT (B5)

(2) Turn on electrical power (Ref. 24-00-00).

(3) Verify annunciator system (caution lights) is operational (Ref. 33-17-00). If ECS annunciator light in pilots instrument panel is on, reset annunciator system. ECS light must go off.

(4) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, release CARGO HEAT - FWD, MID, and AFT switchlights to the off (out) position. Verify COLD and HOT lights in switchlights are off.

NOTE: If cargo compartment temperature is below 40 degrees F (4.4 degrees C), and COLD light is on, proceed with test. If above 95 degrees F (35 degrees C) and HOT legend is on, use freon spray to cool OVERTEMPERATURE switch until HOT light is off, then proceed with test.

(5) Establish communication between Flight Engineer/Second Officers station and cargo compartment(s) (Ref. 23-43-00).

R (6) Direct a spray of freon onto the COLD INDICATION and
R FAN CYCLING switches (Ref. Figs. 501, 502 and 503 for switch locations).

R (7) When COLD INDICATION switch has cooled to 35 to 45 degrees F (2 to 7 degrees C) COLD light in applicable switchlight must come on, and cargo heat recirculation fan must not come on.

(8) While COLD light is on, depress applicable CARGO HEAT - FWD, MID, or AFT switchlight to the on (latched in) position. Applicable recirculation fan must come on.

(9) Discontinue freon spray and allow COLD INDICATION and FAN CYCLING switches to warm. If compartment temperature is cool, hold heat gun at least 18 inches from grille and direct heat gun discharge on switches.

(10) When COLD INDICATION switch has warmed to 50 to 60 degrees F (10 to 16 degrees C) the COLD light in the applicable switchlight must go off.

R

(11) When FAN CYCLING switch has warmed to 65 to 75 degrees F (18 to 24 degrees C) the recirculation fan must go off.

(12) Release applicable CARGO HEAT - FWD, MID, or AFT switchlight to the off (out) position.

B. Functional Test (Overtemperature Switch)

(1) Gain access to applicable OVERTEMPERATURE switch:

Forward cargo compartment: Open cargo compartment access panel 122LR.

Mid cargo compartment: Open cargo compartment access panel 152FR.

Aft cargo compartment: Open cargo compartment access panel 162HR.

CAUTION: DO NOT OVERHEAT THERMAL SWITCHES.

MAXIMUM SWITCH TEMPERATURE REQUIRED IS APPROXIMATELY 100 DEGREES F (37.8 DEGREES C). SINCE THE HUMAN HAND TOLERATES APPROXIMATELY 120 DEGREES F (48.9 DEGREES C) WITHOUT EXCESSIVE DISCOMFORT, KEEPING A FINGER OR HAND ON OR NEAR THE THERMAL SWITCH DURING TEST IS AN ACCEPTABLE METHOD TO ESTIMATE TEMPERATURE AND TO PREVENT OVERHEAT.

(2) Depress applicable CARGO HEAT - FWD, MID or AFT switchlight.

(3) Again direct a spray of freon onto the COLD INDICATION and FAN CYCLING switches until COLD light in applicable switchlight comes on.

(4) While keeping COLD INDICATION and FAN CYCLING switches cooled (COLD light on), direct heat gun discharge onto OVERTEMPERATURE switch (protect adjacent wiring and components from heat).

(5) When OVERTEMPERATURE switch has warmed to 90 to 100 degrees F (32 to 38 degrees C) both the CARGO HEAT HOT light in the applicable switchlight and the ECS caution light on the pilots instrument panel must come on.

(6) Reset annunciator system (Ref. 33-17-00). ECS light must go off.

(7) While HOT light is on and corresponding switchlight on (latched in), cargo heat recirculation fan must not come on.

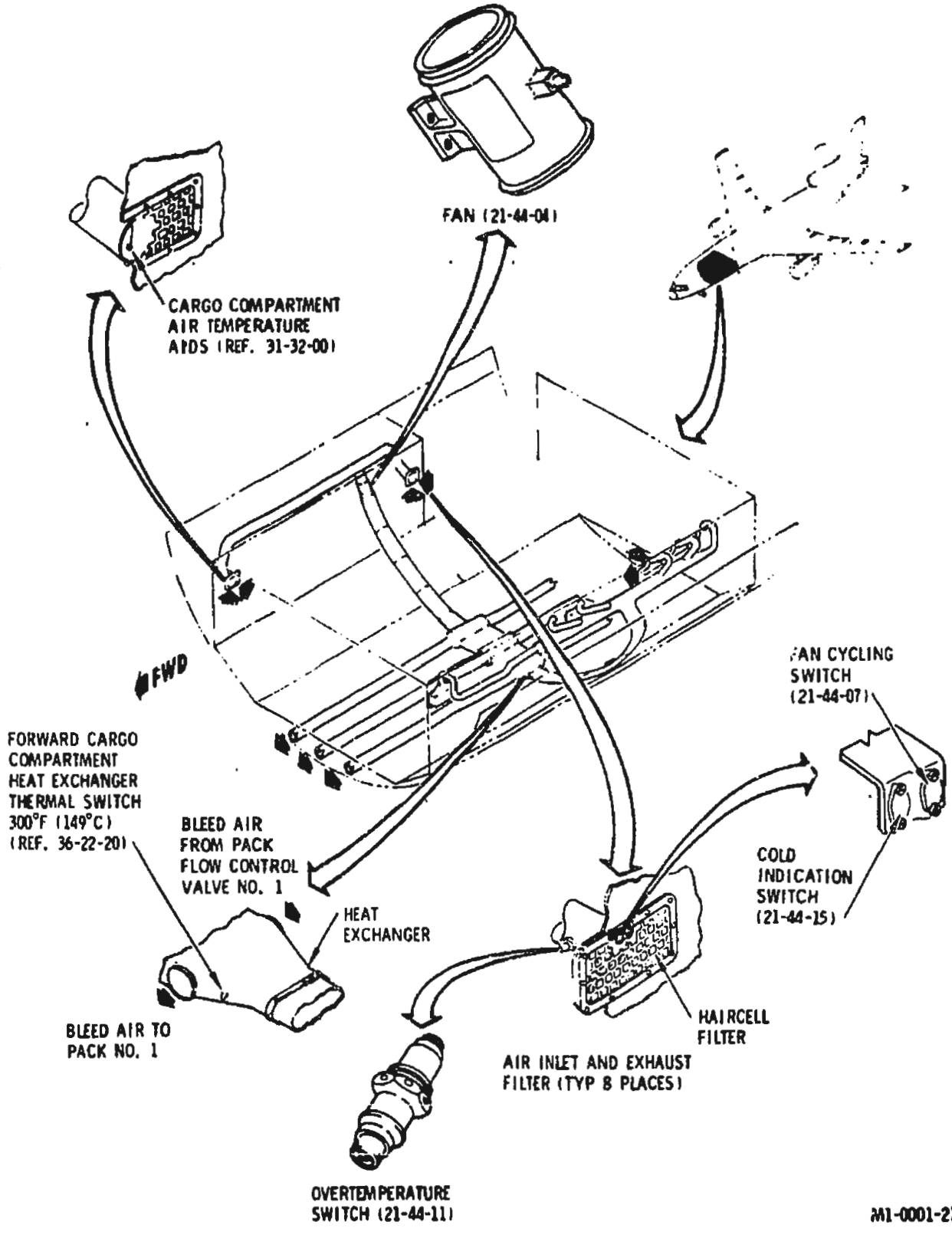
(8) Allow OVERTEMPERATURE switch to cool. If compartment is hot, direct a freon spray onto switch.

(9) When OVERTEMPERATURE switch has cooled to 75 to 85 degrees F (24 to 29 degrees C) the HOT light in the applicable switchlight must go off and the recirculation fan must come on.

(10) Release applicable CARGO HEAT - FWD, MID, or AFT switchlight to the off (out) position.

(11) Close cargo compartment access panel opened in Step 4B(1).

(12) Turn off electrical power (Ref. 24-00-00).


FAN (21-44-04)
CARGO COMPARTMENT AIR TEMPERATURE AIDS (REF. 31-32-00)
FWD
FORWARD CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCH 300°F (149°C) (REF. 36-22-20)
BLEED AIR FROM PACK FLOW CONTROL VALVE NO. 1
HEAT EXCHANGER
BLEED AIR TO PACK NO. 1
FAN CYCLING SWITCH (21-44-07)
COLD INDICATION SWITCH (21-44-15)
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
OVERTEMPERATURE SWITCH (21-44-11)

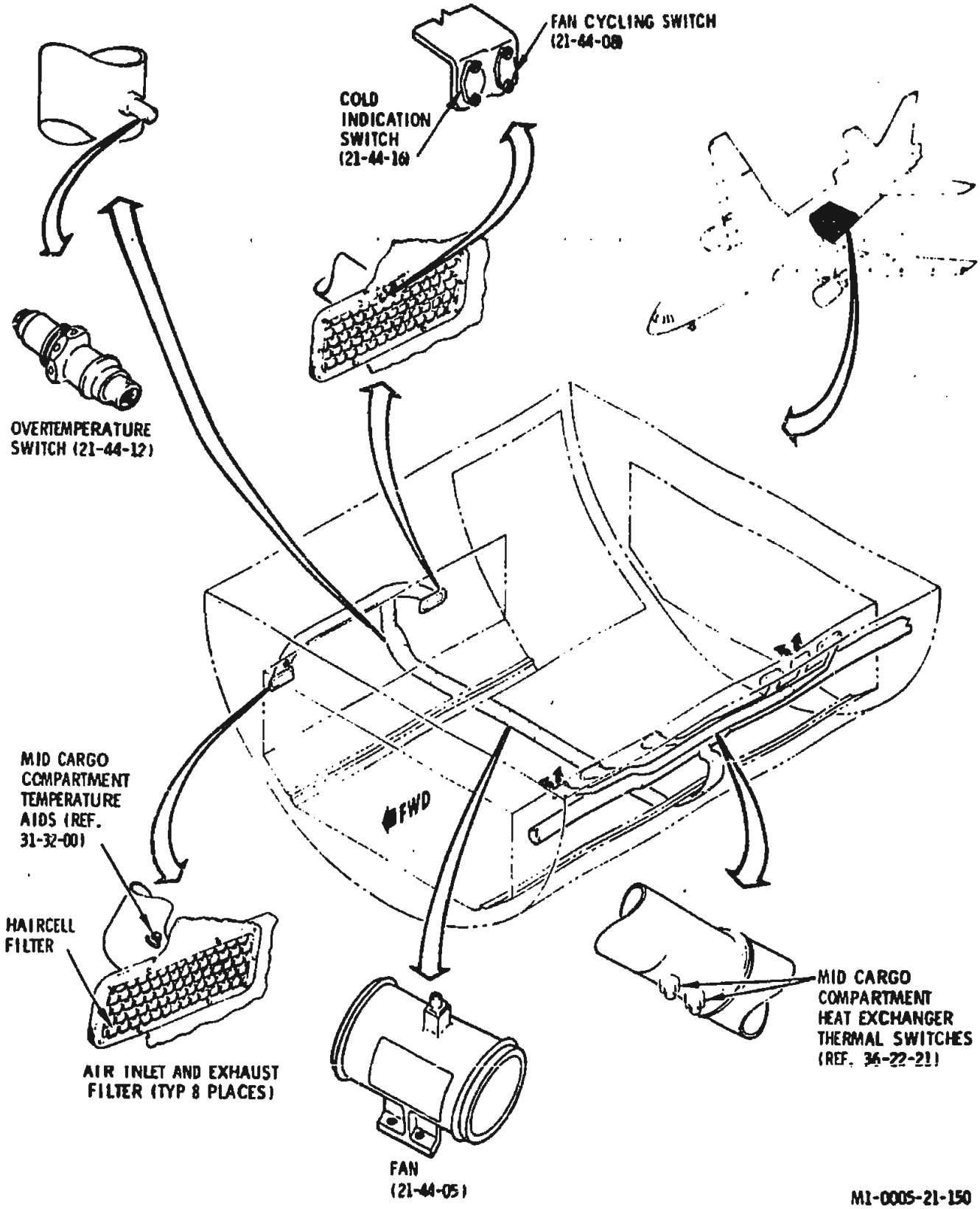
M1-0001-21-357

R
R

Forward Cargo Heat System
Figure 501

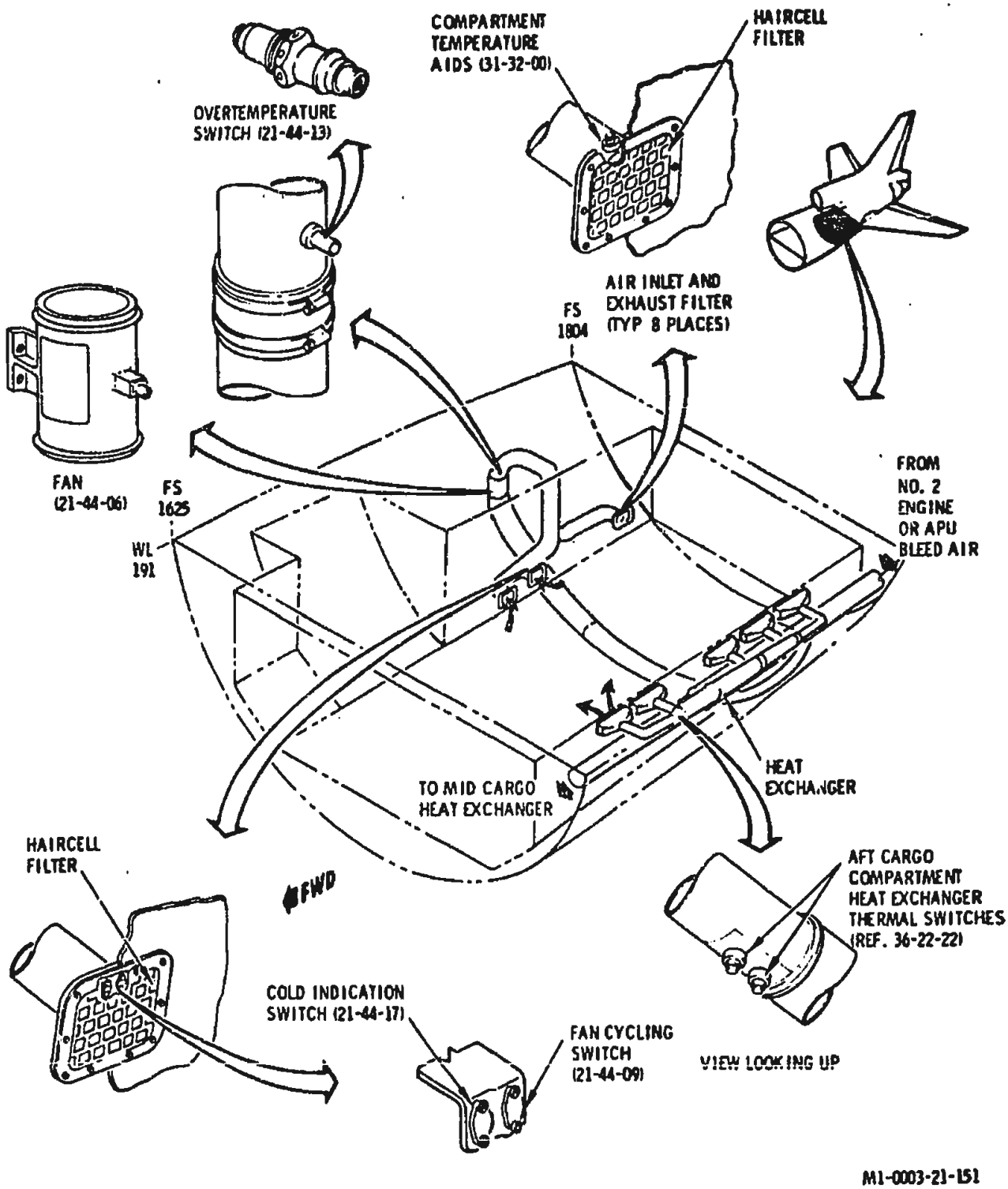
EFFECTIVITY: ALL

001B


FAN CYCLING SWITCH (21-44-08)
COLD INDICATION SWITCH (21-44-16)
OVERTEMPERATURE SWITCH (21-44-12)
MID CARGO COMPARTMENT TEMPERATURE AIDS (REF. 31-32-00)
HAIRCELL FILTER
AIR INLET AND EXHAUST FILTER (TYP 8 PLACES)
FWD
FAN (21-44-05)
MID CARGO COMPARTMENT HEAT EXCHANGER THERMAL SWITCHES (REF. 36-22-21)
MI-0005-21-150

R
R

Mid Cargo Heat System
Figure 502



R
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Aft Cargo Heat System
Figure 503

EFFECTIVITY: ALL

001B

FORWARD CARGO COMPARTMENT HEAT EXCHANGER REMOVAL AND INSTALLATION

1. General

The forward cargo compartment heat exchanger forms part of the pneumatic ducting between the three pack flow control valves and the three air cycle packs. The heat exchanger lies across the bottom of the fuselage under the forward compartment, between FS 589 and FS 609.

2. Equipment and Materials

Protective caps

Adhesive, Silicone, General Electric RTV 154, or equivalent

3. Referenced Procedures

20-00-06	Safetying Practices
20-36-01	Single T-bolt V-band Couplings - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System - Adjustment and Test
36-22-20	Forward Cargo Compartment Heat Exchanger Thermal Switch - Removal and Installation

4. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL
R COMPLETION OF PROCEDURE.

R RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

DUCT AREA - OVHT DET - DC (W13),

DUCT AREA - OVHT DET - AC (W14).

R (2) Remove forward cargo compartment floor panels 124HT and 124JT.

CAUTION: DO NOT DAMAGE AREA OVERHEAT SENSORS.

(3) Identify, then disconnect, area overheat sensor wiring (crossing over heat exchanger) at receptacles aft of heat exchanger. Disconnect wire clamps on heat exchanger, install protective caps on connectors and receptacles, and stow wiring to prevent damage.

(4) Remove forward cargo compartment heat exchanger thermal switch (Ref. 36-22-20).

(5) At outboard ends of heat exchanger, remove band clamps securing hoses to heat exchanger and work hoses off ends of heat exchanger (Ref. Fig. 401).

NOTE: Use thin blunt tool as necessary to release adhesive bond between hoses and heat exchanger.

CAUTION: DO NOT DAMAGE RUBBER BOOTS ON HEAT EXCHANGER AT PNEUMATIC DUCT CONNECTIONS ON FORWARD AND AFT FACES OF HEAT EXCHANGER.

(6) Remove safety wire securing duct coupling covers (Ref. 20-00-06).

(7) At forward and aft faces of heat exchanger, remove insulating covers from six duct connections.

(8) Remove six single T-bolt V-band couplings (Ref. 20-36-01) from pneumatic duct to heat exchanger connections.

(9) Remove mounting bolts securing heat exchanger to support structure.

(10) Raise right end of heat exchanger enough to clear connecting duct and carefully pull heat exchanger from between ends of pneumatic ducts and remove through right side of opening in floo .

(11) Install protective caps on all exposed duct and heat exchanger openings.

(12) Remove insulation blanket from heat exchanger and retain for installation.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

CAUTION: DO NOT DAMAGE RUBBER BOOTS ON HEAT EXCHANGER AT PNEUMATIC DUCT CONNECTIONS ON FORWARD AND AFT FACES OF HEAT EXCHANGER.

(2) Note directions of air flow arrows on heat exchanger, and install insulation blanket on heat exchanger.

(3) Remove protective caps from all duct and heat exchanger openings. Wipe mating surfaces clean and inspect for damage. Repair or replace any damaged component.

(4) Remove any excess adhesive from inside hoses on ducts outboard of each end of heat exchanger position.

CAUTION: DO NOT DAMAGE AREA OVERHEAT SENSORS.

(5) With heat exchanger air flow arrows pointing forward and to left (Ref. Fig. 401), move heat exchanger carefully into mounting position between pneumatic duct ends through right side of opening in floor.

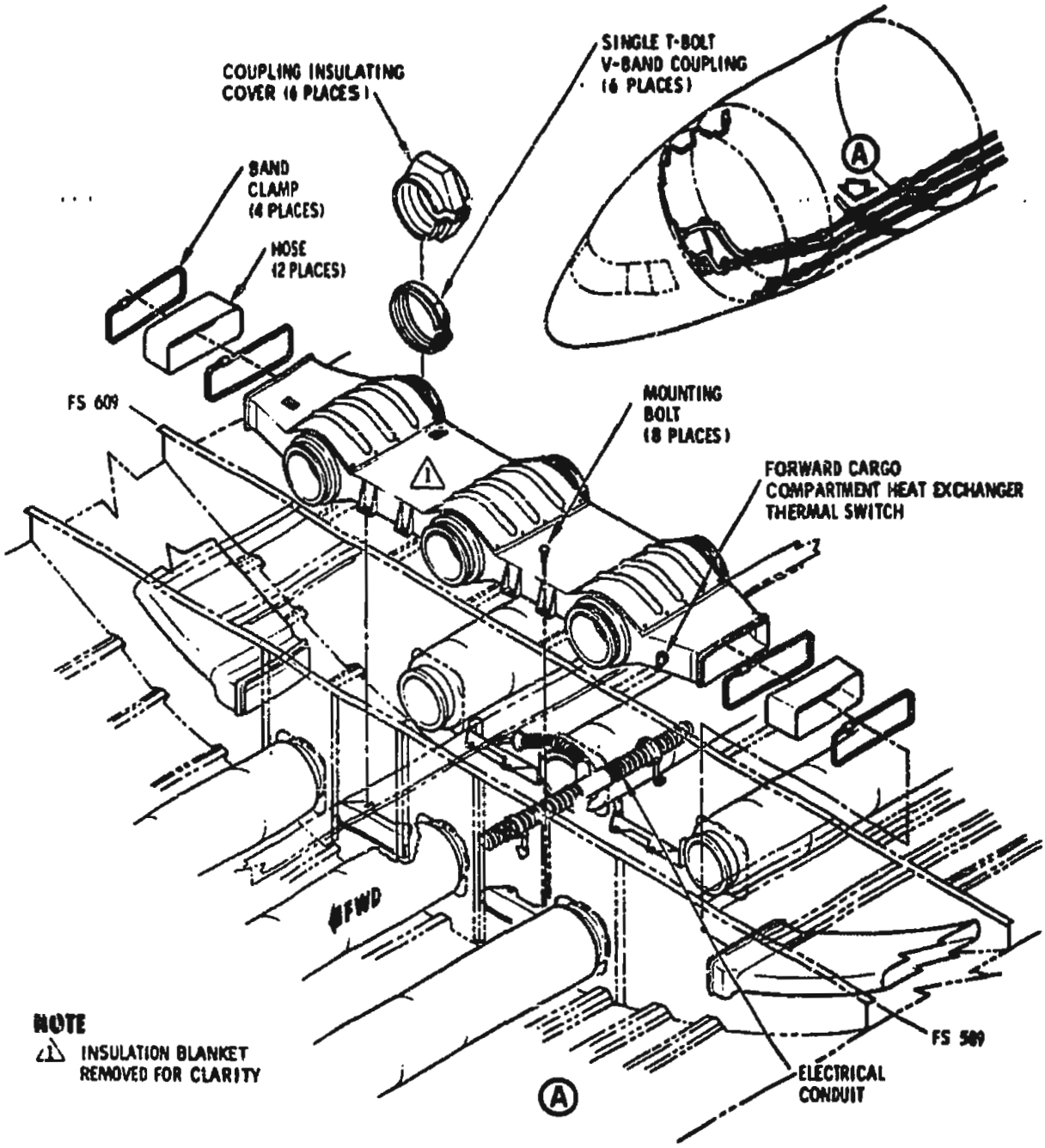
(6) Apply adhesive to mating surfaces of outboard heat exchanger ducts (between heat exchanger connection and hose) and work hoses onto heat exchanger.

(7) Loosely install mounting bolts securing heat exchanger to support structure.

(8) Carefully align pneumatic ducts, forward and aft of heat exchanger, with heat exchanger connections.

NOTE: Loose mounting bolts allow slight movement of heat exchanger for alignment of all duct connections. If individual duct(s) are misaligned, adjust duct supports forward or aft of heat exchanger as necessary.

CAUTION: DO NOT PRELOAD PNEUMATIC DUCT TO HEAT EXCHANGER CONNECTIONS BY USING COUPLINGS TO FORCE ALIGNMENT.



HH 8951
M1-0101-21-203

Forward Cargo Compartment Heat Exchanger - Removal and Installation
Figure 401

(9) Install and torque six single T-bolt V-band couplings (Ref. 20-36-01) on pneumatic duct to heat exchanger connections.

(10) Check that heat exchanger mounting brackets are in contact with support structure. If brackets are not in contact, repeat Steps 4B(8) and 4B(9) to obtain bracket and support structure contact.

(11) Torque heat exchanger mounting bolts.

(12) Install band clamps securing hoses to outboard ends of heat exchanger.

(13) Install forward cargo compartment heat exchanger thermal switch (Ref. 36-22-20).

(14) Remove protective caps and install area overheat sensor wiring disconnected in Step 4A(3).

(15) Remove tags and close circuit breakers opened in Step 4A(1).

(16) Perform pertinent portion of Bleed Air Area Overheat Warning System BITE check (Ref. 36-22-00).

(17) Remove WARNING tags installed in Step 4.

(18) Operate air conditioning system (Ref. 21-00-00) and check all disturbed connections for leaks.

(19) Turn off air conditioning system.

(20) On forward and aft faces of heat excharger, install insulating covers over six duct connections.

(20) Secure duct coupling covers with safety wire (Ref. 20-00-06).

(22) Install forward cargo compartment floor panels removed in Step 4A(2).

MID_CARGO_COMPARTMENT_HEAT_EXCHANGER_-_REMOVAL_AND_INSTALLATION

1. General

The mid cargo compartment heat exchanger forms part of the pneumatic ducting system in the left cheek area outboard of this compartment, zone 153. The heat exchanger is between FS 1443 and FS 1523. Access and removal is through mid cargo compartment vertical sidewall liner panels 153DL, 153FL, and 153HL.

2. Equipment and Materials

Gasket, PN 1549985-101, or equivalent

Protective caps

3. Referenced Procedures

20-00-06	Safetying Practices
20-36-01	Single T-bolt V-band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
25-51-06	Cargo Compartment Liner Panels - Removal and Installation
36-00-00	Pneumatic System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System - Adjustment and Test

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) bleed air and APU control panels and the three high-pressure ground air connections to prevent system operation until completion of procedures.

R (2) Remove mid cargo compartment vertical sidewall liner panels 153FL, and 153HL (Ref. 25-51-06).

R (3) Remove bolts securing FS 1585 vertical sidewall liner
R panel support (behind panel 153HL) and remove support.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

CAUTION: SUPPORT HEAT EXCHANGER DURING REMOVAL.

R BLEED AIR AREA OVERHEAT WARNING SYSTEM SENSORS
R (REF. 36-22-00) ARE INSTALLED NEAR DUCTS AND HEAT
R EXCHANGER. USE EXTREME CARE AT ALL TIMES TO AVOID
R DAMAGE TO SENSORS. WHEN NECESSARY TO PREVENT
R SENSOR DAMAGE, DISCONNECT SENSOR SUPPORTS AND
R CAREFULLY MOVE SENSORS ASIDE. REPOSITION SENSORS
R AND REINSTALL SUPPORTS WHEN HEAT EXCHANGER
R INSTALLATION IS COMPLETE.

R (4) Remove duct section aft of heat exchanger, to obtain clearance to remove heat exchanger (Ref. Fig. 401).

(a) Remove safety wire securing duct coupling cover (Ref. 20-00-06).

(b) Remove covers over couplings at each end of duct section and slide covers onto duct section.

(c) Remove single T-bolt V-band couplings (Ref. 20-36-01) at aft end of heat exchanger and at aft end of duct section and slide couplings onto duct section.

(d) Mark duct for forward/aft orientation, remove support clamp from duct section, slide duct from between heat exchanger and duct ends and remove duct through space where vertical support was removed.

R (5) Loosen band clamp securing flexible air duct to heat
R exchanger inlet, below heat exchanger, and work duct
R and band clamp off heat exchanger.

R (6) Remove bolts securing heat exchanger outlet flange to
R flange on duct above heat exchanger. Remove and
R discard gasket from between flanges.

R (7) Remove cover over coupling at forward end of heat
R exchanger and slide cover onto duct.

R (8) Remove single T-bolt V-band coupling at forward end of
R heat exchanger and slide coupling onto duct.

R (9) Move heat exchanger aft and remove from cheek area
R through space where vertical support was removed.

R (10) Install protective caps on exposed heat exchanger and
R duct openings.

R (11) Remove insulation blanket from heat exchanger and retain for installation.

B. Installation

R (1) Verify that tags previously installed on FE/SO bleed
R air and APU control panels and the three high-pressure
R ground air connectors are in place.

R (2) When installing insulation on heat exchanger do the
R following:

R (a) Leave ends of heat exchanger above glass cloth
R tape uninsulated/uncovered (Ref. Fig. 401), even
R if it was covered on heat exchanger that was
R removed.

R (b) Use NO batt tape to close end of heat exchanger or
R to pull blanket down at ends, even if batt tape
R was used on heat exchanger that was removed.

R (3) Install insulation blanket (retained from removal) on
R heat exchanger.

R (4) Remove protective caps from heat exchanger and duct
R openings, wipe all mating surfaces clean and inspect
R for damage. Repair or replace any damaged component.

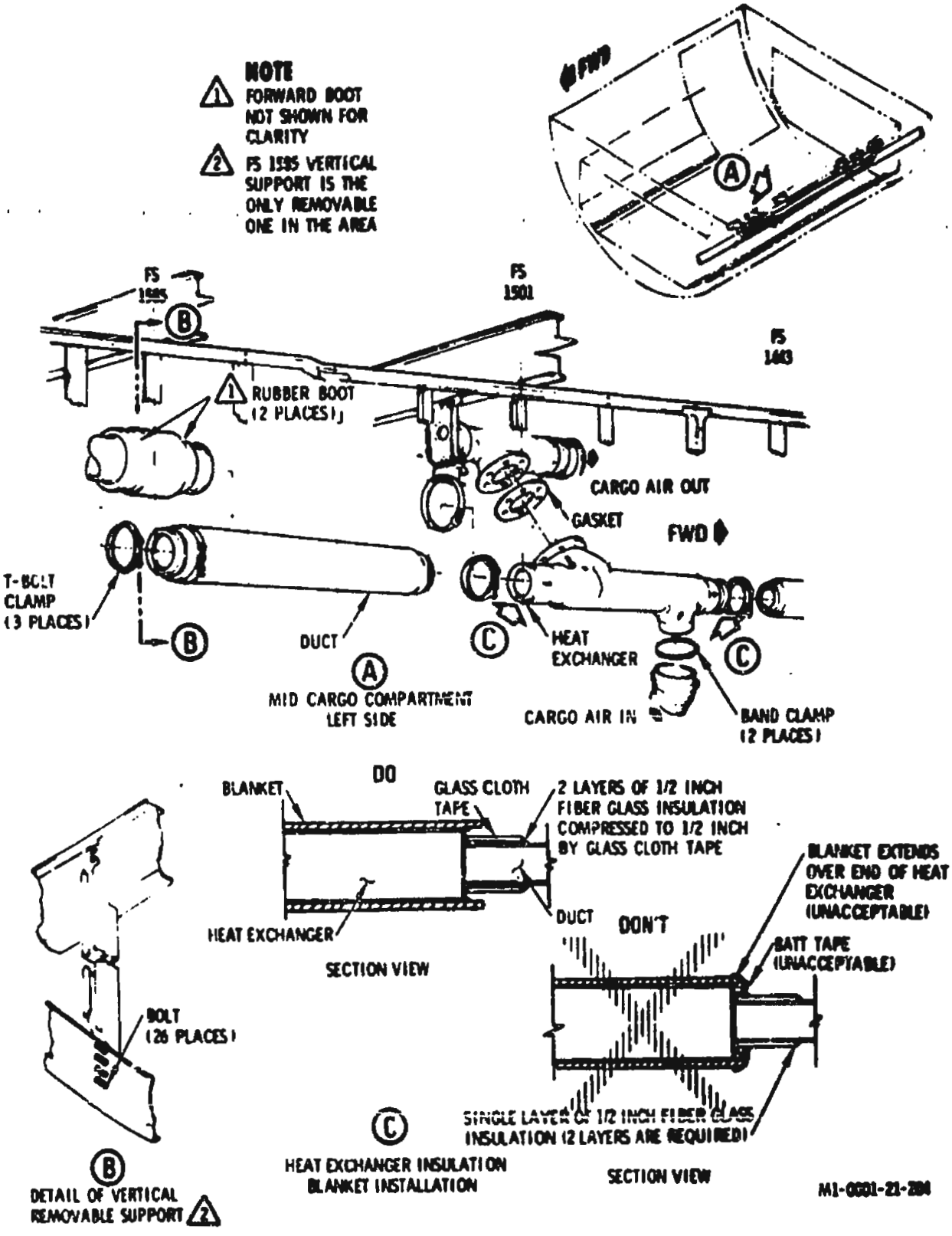
R (5) Position heat exchanger for correct forward/aft orientation (Ref. Fig. 401) and move into position through space where vertical support was removed.

CAUTION: SUPPORT HEAT EXCHANGER DURING INSTALLATION.

R (6) Loosely install single T-bolt V-band coupling securing
R forward end of heat exchanger to duct.

R (7) Position heat exchanger to align heat exchanger outlet
R flange with duct flange above heat exchanger and heat
R exchanger inlet duct with flexible duct below heat
R exchanger.

R (8) Install new gasket between heat exchanger outlet and
R duct flanges and install bolts through flanges.



R Mid Cargo Compartment Heat Exchanger - Removal and Installation
R Figure 401

R (9) Verify single T-bolt V-band couplings and coupling covers are on duct, move duct section into position aft of heat exchanger, and loosely install V-band couplings.

R (10) Install support clamp on duct section and support bracket. Do not tighten clamp.

R (11) Position ducts and heat exchanger for best alignment and torque single T-bolt V-band couplings (Ref. 20-36-01) and tighten support clamp on duct.

R (12) Work flexible duct onto heat exchanger inlet duct, below heat exchanger, and install band clamp.

R (13) Remove WARNING tags installed in Step 4.

R (14) Operate pneumatic system (Ref. 36-00-00) and mid cargo heat system (Ref. 21-00-00) to pressurize ducts.

R (15) Check all disturbed connections for leaks.

R (16) Install insulation covers over single T-bolt V-band couplings ensuring that couplings are fully covered.

NOTE: On aircraft 001-031 with SB21-139 and SB36-038 and 032-033, after installing the cargo compartment heat exchanger the insulation covers must be locked with 20 s.w.g. wire across the two hooks.

R (17) Secure duct coupling cover with safety wire (Ref. 20-00-06).

R (18) Install vertical sidewall liner support removed in Step 4B.

R (19) Install mid cargo compartment vertical sidewall liner panels (Ref. 25-51-06).

AFT CARGO COMPARTMENT HEAT EXCHANGER - REMOVAL AND INSTALLATION

1. General

The aft cargo compartment heat exchanger forms part of the pneumatic ducting system in the left cheek area outboard of this compartment, zone 163. The heat exchanger is between FS 1681 and FS 1751. Access is through aft cargo compartment vertical sidewall liner panels 163AL, 163BL, and 163CL (Ref. 6-50-00). Because of space restrictions, removal is through mid cargo compartment vertical sidewall liner panel 153HL.

2. Equipment and Materials

Gasket, PN 1549985-101, or equivalent

Protective caps

3. Referenced Procedures

6-50-00	Aft Cargo Compartment Interior Panels
20-36-01	Single T-bolt V-band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
25-51-06	Cargo Compartment Liner Panels - Removal and Installation
36-00-00	Pneumatic System - Maintenance Practices
36-22-00	Bleed Air Area Overheat Warning System - Adjustment and Test

R 4. Removal/Installation

R A. Removal

R (1) Tag flight engineer/second officer (FE/SO) bleed air and APU control panels and the three high-pressure ground air connections to prevent system operation until completion of procedures.

R (2) Remove mid cargo compartment vertical sidewall liner panel 153HL (Ref. 25-51-06).

R (3) Remove bolts securing FS 1585 vertical sidewall liner
R panel support (behind panel 153HL) and remove support.

R (4) Remove aft cargo compartment vertical sidewall liner
R panels 163AL, 163BL, and 163CL (Ref. 25-51-06).

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R CAUTION: BLEED AIR AREA OVERHEAT WARNING SYSTEM SENSORS
R (REF. 36-22-00) ARE INSTALLED NEAR DUCTS AND HEAT
R EXCHANGER. USE EXTREME CARE AT ALL TIMES TO AVOID
R DAMAGE TO SENSORS. WHEN NECESSARY, TO PREVENT
R SENSOR DAMAGE, DISCONNECT SENSOR SUPPORTS AND
R CAREFULLY MOVE SENSORS ASIDE. REPOSITION SENSORS
R AND REINSTALL SUPPORTS WHEN HEAT EXCHANGER
R INSTALLATION IS COMPLETE.

R (5) Remove duct section between heat exchanger and duct
R compensator, forward of heat exchanger (Ref. Fig. 401):

R (a) Remove cover over heat exchanger to duct coupling
R and slide cover onto duct section.

R (b) Remove single T-bolt V-band coupling (Ref.
R 20-36-01) at duct to heat exchanger and
R compensator connections and slide couplings onto
R duct section.

R (c) Mark duct section for forward/aft orientation and
R remove duct by sliding from between heat exchanger
R and compensator.

R (6) Loosen band clamp securing flexible air duct to heat
R exchanger inlet, below heat exchanger, and work duct
R and clamp off heat exchanger.

R (7) Remove bolts securing heat exchanger outlet flange to
R flange on duct above heat exchanger. Remove and
R discard gasket from between flanges.

R (8) Remove cover over coupling at aft end of heat exchanger
R and slide cover aft onto duct.

R CAUTION: SUPPORT HEAT EXCHANGER DURING REMOVAL.

R (9) Remove single T-bolt V-band coupling at aft end of heat
R exchanger and slide coupling onto duct.

R (10) Disconnect support clamp at forward end of heat
R exchanger, leaving open clamp on support bracket.

R (11) Lower heat exchanger to clear duct compensator, move heat exchanger forward to mid cargo cheek area, and remove from cheek area through space where vertical support was removed.

R (12) Install protective caps on exposed heat exchanger and duct openings.

R (13) Remove insulation blanket from heat exchanger and retain for installation.

R B. Installation

R (1) Verify that tags previously installed on FE/SO bleed air and APU control panels and the three high-pressure ground air connections are in place.

R (2) When installing insulation on heat exchanger do the following:

R (a) Leave ends of heat exchanger above glass cloth tape uninsulated/uncovered (Ref. Fig. 401), even if it was covered on heat exchanger that was removed.

R (b) Use NO batt tape to close end of heat exchanger or to pull blanket down at ends, even if batt tape was used on heat exchanger that was removed.

R (3) Install insulation blanket (retained from removal) on heat exchanger as shown on Fig. 401.

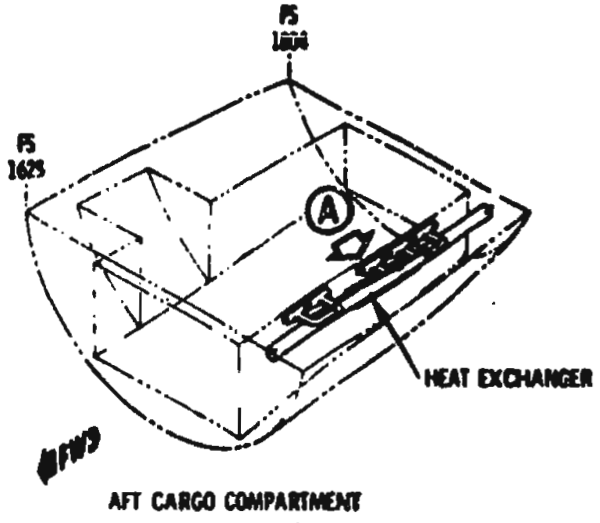
R (4) Remove protective caps from heat exchanger and duct openings, wipe all mating surfaces clean and inspect for damage. Repair or replace any damaged component.

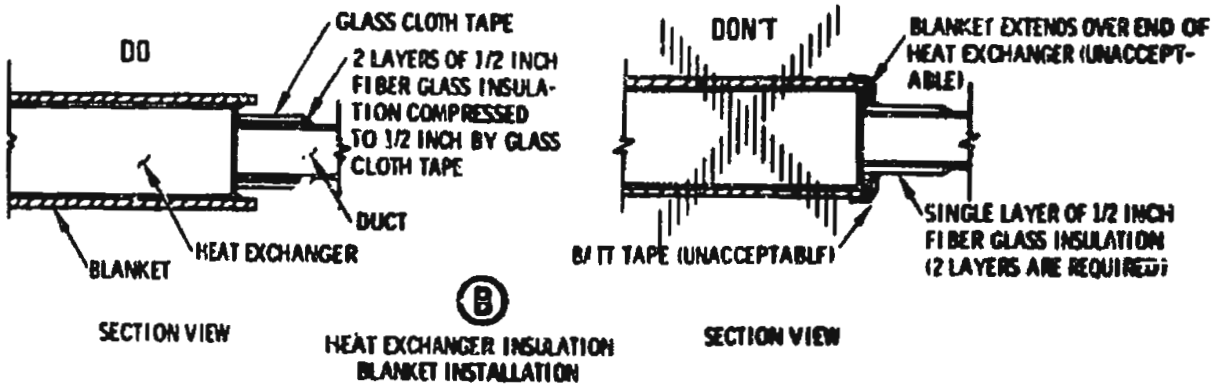
R (5) Position heat exchanger for correct forward/aft orientation (Ref. Fig. 401) and move into left cheek area of mid cargo compartment through space where vertical support was removed.

R (6) Move heat exchanger aft in left cheek area to installed position outboard of aft cargo compartment.

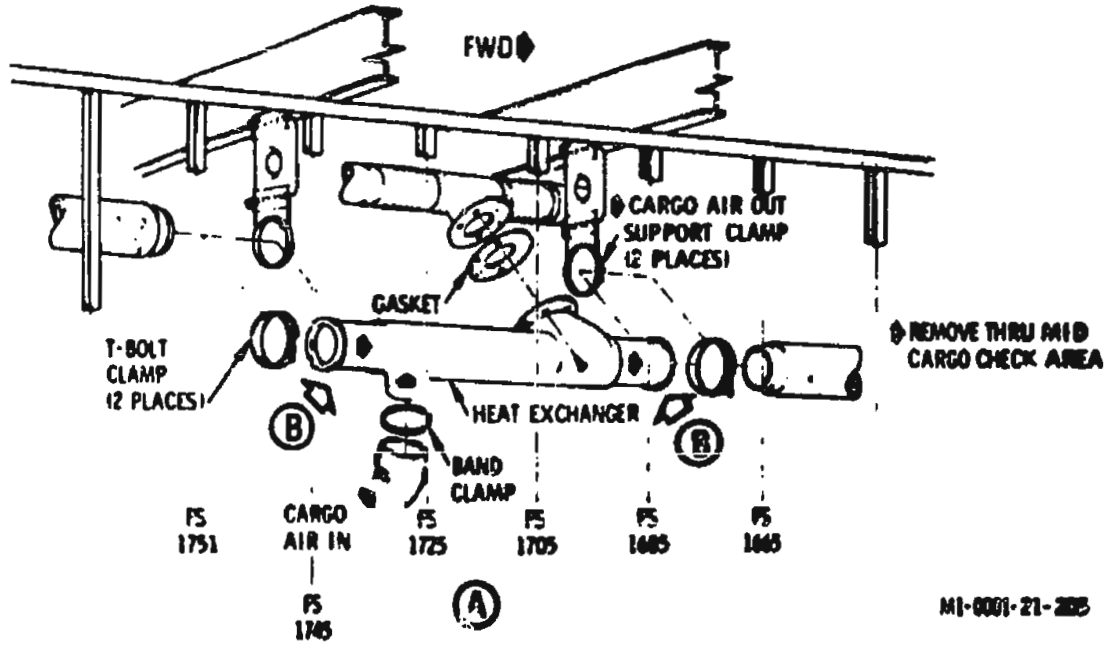
R (7) Raise heat exchanger into position, rotating to align inlet duct and discharge duct connections, and install support clamp at forward end of heat exchanger. Do not tighten support clamp.

R (8) Loosely install single T-bolt V-band coupling securing aft end of heat exchanger to duct.




DO
GLASS CLOTH TAPE
2 LAYERS OF 1/2 INCH FIBER GLASS INSULATION COMPRESSED TO 1/2 INCH BY GLASS CLOTH TAPE
DUCT
BLANKET
HEAT EXCHANGER
SECTION VIEW
DON'T
BLANKET EXTENDS OVER END OF HEAT EXCHANGER (UNACCEPTABLE)
SINGLE LAYER OF 1/2 INCH FIBER GLASS INSULATION (2 LAYERS ARE REQUIRED)
SECTION VIEW

B
HEAT EXCHANGER INSULATION BLANKET INSTALLATION



M1-0001-21-285

R Aft Cargo Compartment Heat Exchanger - Removal and Installation
R Figure 401

R (9) Install duct section between heat exchanger and duct
R compensator, forward of heat exchanger:

R (a) Verify forward/aft orientation of duct section and
R that single T-bolt V-band couplings and coupling
R cover are on duct, then slide duct section into
R position between heat exchanger and duct
R compensator.

R (b) Loosely install single T-bolt V-band couplings at
R each end of duct section, securing duct section to
R heat exchanger and compensator.

R (10) Position heat exchanger to align heat exchanger outlet
R flange with duct flange above heat exchanger. Install
R new gasket between flanges and install bolts through
R flanges.

R (11) Tighten support clamp at forward end of heat exchanger.

R (12) Position ducts and heat exchanger for best alignment
R and torque single T-bolt V-band couplings (Ref.
R 20-36-01).

R (13) Work flexible duct onto heat exchanger inlet duct,
R below heat exchanger, and install band clamp.

R (14) Remove WARNING tags installed at start of Step 4.

R (15) Operate pneumatic system (Ref. 36-00-00) and aft cargo
R heat system (Ref. 21-00-00) to pressurize ducts.

R (16) Check all disturbed connections for leaks.

R (17) Install insulation covers over single T-bolt V-band couplings ensuring that couplings are fully covered.

R NOTE: On aircraft 001-031 with SB21-139 and SB36-038, after installing the cargo compartment heat exchanger the insulation covers must be locked with 20 s.w.g. wire across the two hooks.

R (18) Install vertical sidewall liner support removed in Step
R 4B.

R (19) Install mid and aft cargo compartment vertical sidewall liner panels (Ref. 25-51-06).

CARGO COMPARTMENT FANS - MAINTENANCE PRACTICES

1. General

When the aft cargo heat system is inoperative, due to an inoperative compartment fan, live cargo heat requirements must be considered.

2. Maintenance Practices

A. Deactivation

(1) On galley left circuit breaker panel, zone 137, open and collar applicable circuit breakerCOMPT FANS - CARGO - FWD, MID, or AFT.

(2) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, placard applicable CARGO HEAT indicator light CARGO COMPT FAN INOPERATIVE.

(3) Make appropriate entry in aircraft log book.

FORWARD CARGO COMPARTMENT FAN - REMOVAL AND INSTALLATION

1. General

The forward cargo compartment fan is in the right cheek area outboard of the forward cargo compartment, zone 122, approximately 3 feet forward of the cargo compartment door. Access is through vertical sidewall access panel 122LR.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

21-44-00 Cargo Heat System - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On galley left circuit breaker panel, zone 131, open and tag circuit breaker COMPT FANS - CARGO - FWD.

(2) Remove forward cargo compartment access panel 122LR, forward of cargo compartment door.

(3) Disconnect electrical cable connector from fan receptacle.

(4) Install protective caps on connector and receptacle and stow cable to prevent damage.

(5) Remove five band clamps securing hoses and support brackets to fan, ducts, and sleeve (Ref. Fig. 401).

(6) Support fan and remove fan mounting bolts.

(7) Work hoses loose at duct ends and remove fan, hoses, and sleeve from mounting support.

(8) Remove hoses and sleeve from fan and retain for installation.

(9) Install protective caps on duct openings.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Install short hose on inlet end of fan (check flow arrow on fan).

(3) Install sleeve in center of long hose and install hose/sleeve on discharge end of fan.

(4) Remove protective caps from duct openings.

(5) With fan air flow arrow pointed downward, work hoses onto ducts and position fan on mounting support (Ref. Fig. 401).

(6) Install fan mounting bolts.

(7) Install band clamp securing hose and support bracket to duct above fan.

(8) Install band clamp securing hose and support bracket to duct below fan and sleeve.

(9) Install band clamp securing hose and support bracket to sleeve between fan and duct.

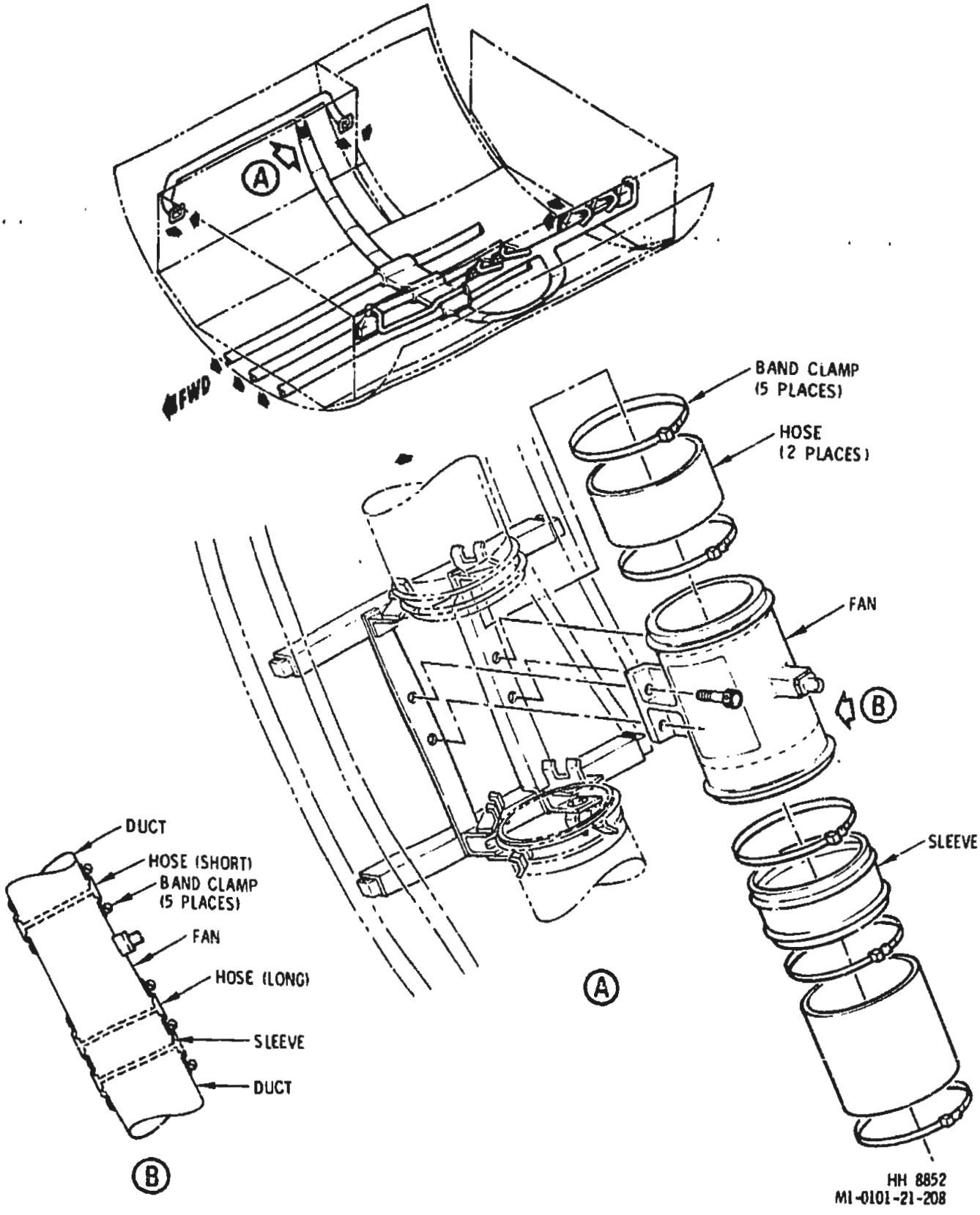
(10) Install band clamps securing hoses at each end of fan.

(11) Remove protective caps and connect electrical cable connector to fan receptacle.

(12) Remove tag and close circuit breaker opened in Step 4A(1).

(13) Perform pertinent portion of Cargo Heat System - Adjustment and Test procedure (Ref. 21-44-00) to verify fan operation.

(14) Install access panel 122LR.



R Forward Cargo Compartment Fan - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

MID CARGO COMPARTMENT FAN - REMOVAL AND INSTALLATION

1. General

The mid cargo compartment fan is in the duct crossing the bottom of the fuselage, just left of aircraft centerline, under the mid cargo compartment floor, zone 154. The fan is at FS 1472 and access is through cargo compartment floor access panel 154HT.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

21-44-00 Cargo Heat System - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On galley left circuit breaker panel, zone 130, open and tag circuit breaker COMPT FANS - CARGO - MID.

(2) Remove mid cargo compartment floor access panel 154HT.

(3) Disconnect electrical cable connector from fan receptacle.

(4) Install protective caps on connector and receptacle and stow cable to prevent damage.

(5) Remove five band clamps securing hoses and support brackets to fan, ducts, and sleeve (Ref. Fig. 401).

(6) Remove fan mounting bolts.

(7) Work hoses loose at duct ends and remove fan, hoses, and sleeve from mounting support.

(8) Remove hoses and sleeve from fan and retain for installation.

(9) Install protective caps on duct openings.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Install short hose on inlet end of fan (check flow arrow on fan).

(3) Install sleeve in center of long hose and install hose/sleeve on discharge end of fan.

(4) Remove protective caps from duct openings.

(5) With fan air flow arrow pointed left, work hoses onto ducts and position fan on mounting support (Ref. Fig. 401).

(6) Install fan mounting bolts.

(7) Install band clamp securing hose and support bracket to duct at right end of fan.

(8) Install band clamp securing hose and support bracket to duct at left end of fan and sleeve.

(9) Install band clamp securing hose and support bracket to sleeve between fan and duct.

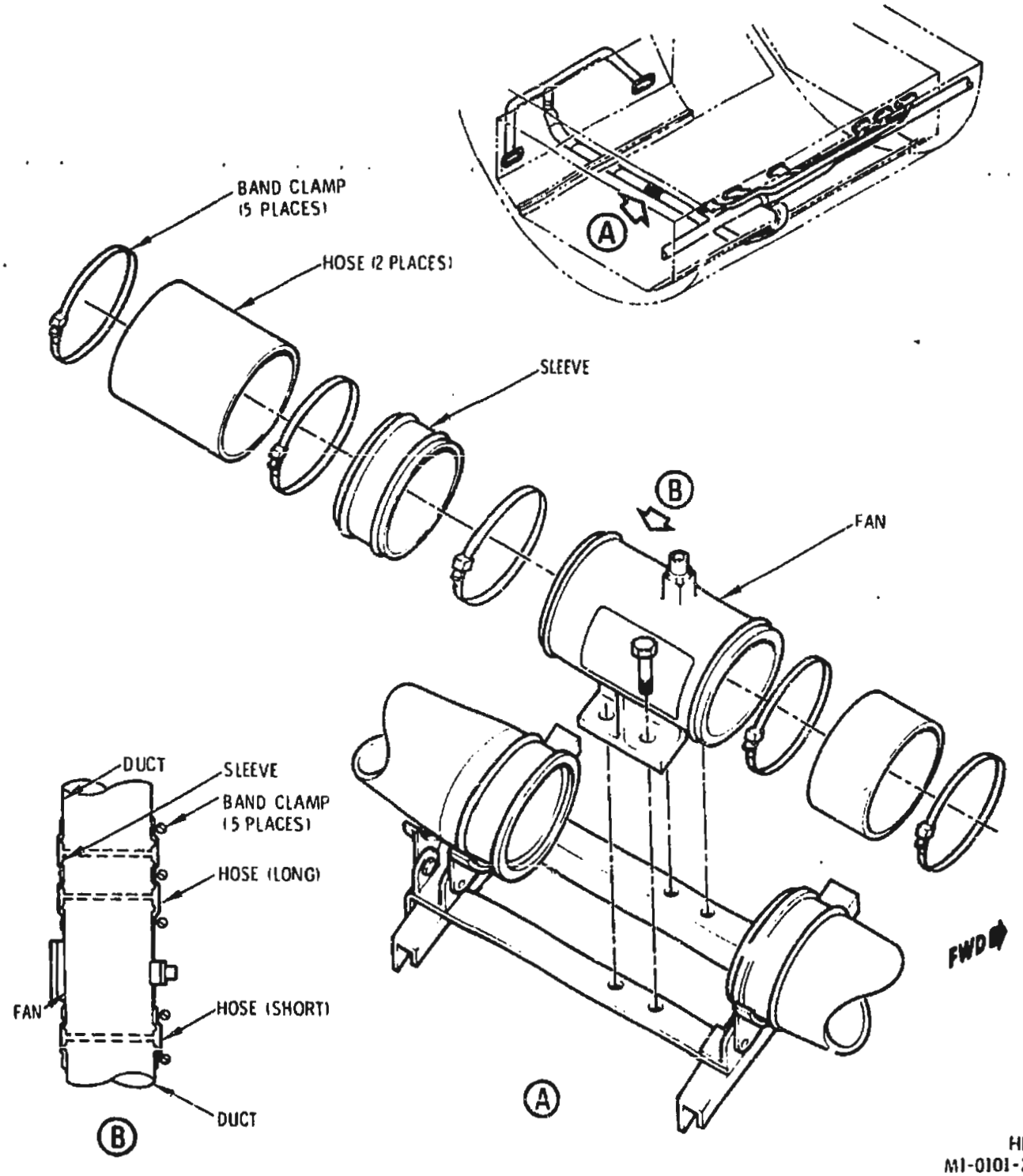
(10) Install band clamps securing hoses at each end of fan.

(11) Remove protective caps and connect electrical cable connector to fan receptacle.

(12) Remove tag and close circuit breaker opened in Step 4A(1).

(13) Perform pertinent portion of Cargo Heat System - Adjustment and Test procedure (Ref. 21-44-00) to verify fan operation.

(14) Install compartment floor access panel removed in Step 4A(2).



HH 8864
MI-0101-21-209

R Mid Cargo Compartment Fan - Removal and Installation
R Figure 401

R AFT CARGO COMPARTMENT REAR FAN - REMOVAL AND INSTALLATION

1. General

The aft cargo compartment fan is in the right cheek area outboard of the aft cargo compartment, zone 162, aft of the cargo compartment door. Access is through vertical sidewall liner panel 162FR.

2. Equipment and Materials

Protective caps

3. Referenced Procedures

21-44-00	Cargo Heat Systems - Adjustment and Test
25-51-06	Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

R (1) On galley left circuit breaker panel, zone 130, open and tag circuit breaker COMPT FANS - CARGO - AFT (B5).

(2) Remove aft cargo compartment vertical sidewall liner panel 162FR (Ref. 25-51-06) aft of compartment door.

(3) Disconnect electrical cable connector from fan receptacle.

(4) Install protective caps on connector and receptacle and stow cable to prevent damage.

(5) Remove five band clamps securing hoses and support brackets to fan, ducts, and sleeve (Ref. Fig. 401).

(6) Support fan and remove fan mounting bolts.

(7) Work hoses loose at duct ends and remove fan, hoses and sleeve from mounting support.

(8) Remove hoses and sleeve from fan and retain for installation.

R (9) Install protective caps on duct openings.

R B. Installtion

R (1) Verify circuit breaker opened in Step 4A(1) is open and
R tagged.

R (2) Install short hose on inlet end of fan (check flow
R arrow on fan).

R (3) Install sleeve in center of long hose and install
R hose/sleeve on discharge end of fan.

R (4) Remove protective caps from duct openings.

R (5) With fan air flow arrow pointed downward, work hoses
R onto ducts and position fan on mounting support (Ref.
R Fig. 401).

R (6) Install fan mounting bolts.

R (7) Install band clamp securing hose and support bracket to
R duct above fan.

R (8) Install band clamp securing hose and support bracket to
R duct below fan and sleeve.

R (9) Install band clamp securing hose and support bracket to
R sleeve between fan and duct.

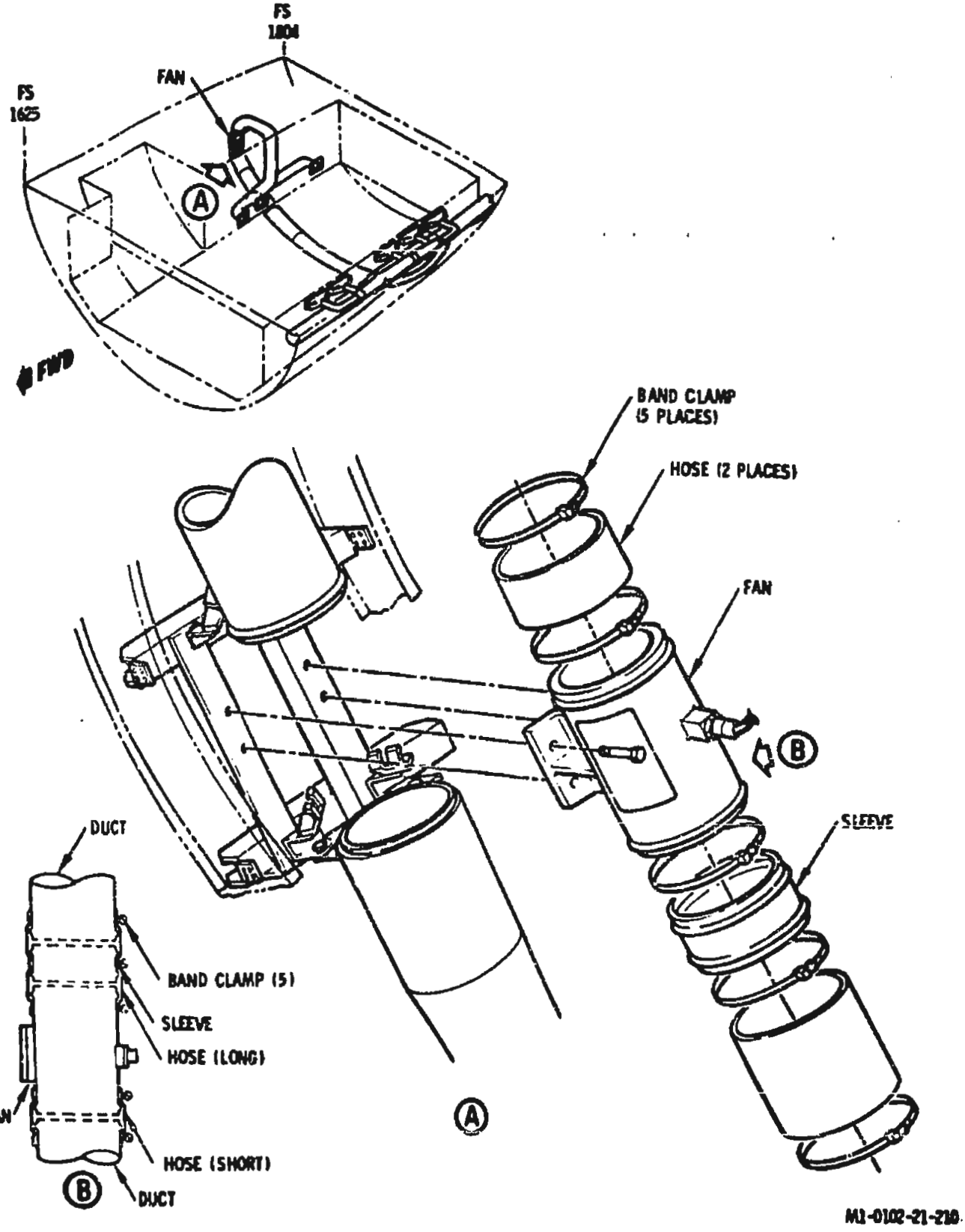
R (10) Install band clamps securing hoses at each end of fan.

R (11) Remove protective caps and connect electrical cable
R connector to fan receptacle.

R (12) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (13) Perform pertinent portion of Cargo Heat System -
R Adjustment and Test procedure (Ref. 21-44-00) to verify
R fan operation.

R (14) Install vertical sidewall liner panel 162FR (Ref.
R 25-51-06).



R Aft Cargo Compartment Fan - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

CARGO COMPARTMENT FAN CYCLING SWITCHES MAINTENANCE PRACTICES

1. General

When the aft cargo heat system is inoperative, due to an inoperative compartment fan cycling switch, live cargo heat requirements must be considered.

2. Maintenance Practices

A. Deactivation

R (1) On galley left circuit breaker panel, zone 137, open and collar applicable circuit breaker COMPT FANS - CARGO - FWD, MID, or AFT.

(2) On Flight Engineer/Second Officers ECS MONITOR panel, placard applicable CARGO HEAT indicator light FAN CYCLING SWITCH INOPERATIVE.

(3) Make appropriate entry in aircraft log book.

FORWARD CARGO COMPARTMENT FAN CYCLING SWITCH REMOVAL AND INSTALLATION

1. General

The forward cargo compartment fan cycling switch is mounted behind the aft right exhaust grille in the cargo compartment wall, zone 122. It is installed aft of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

25-51-06 Forward Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CARGO TEMP FWD MID.

(2) In forward cargo compartment, remove aft right exhaust grille.

(3) Remove cargo compartment liner panel (Ref. 25-51-06).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

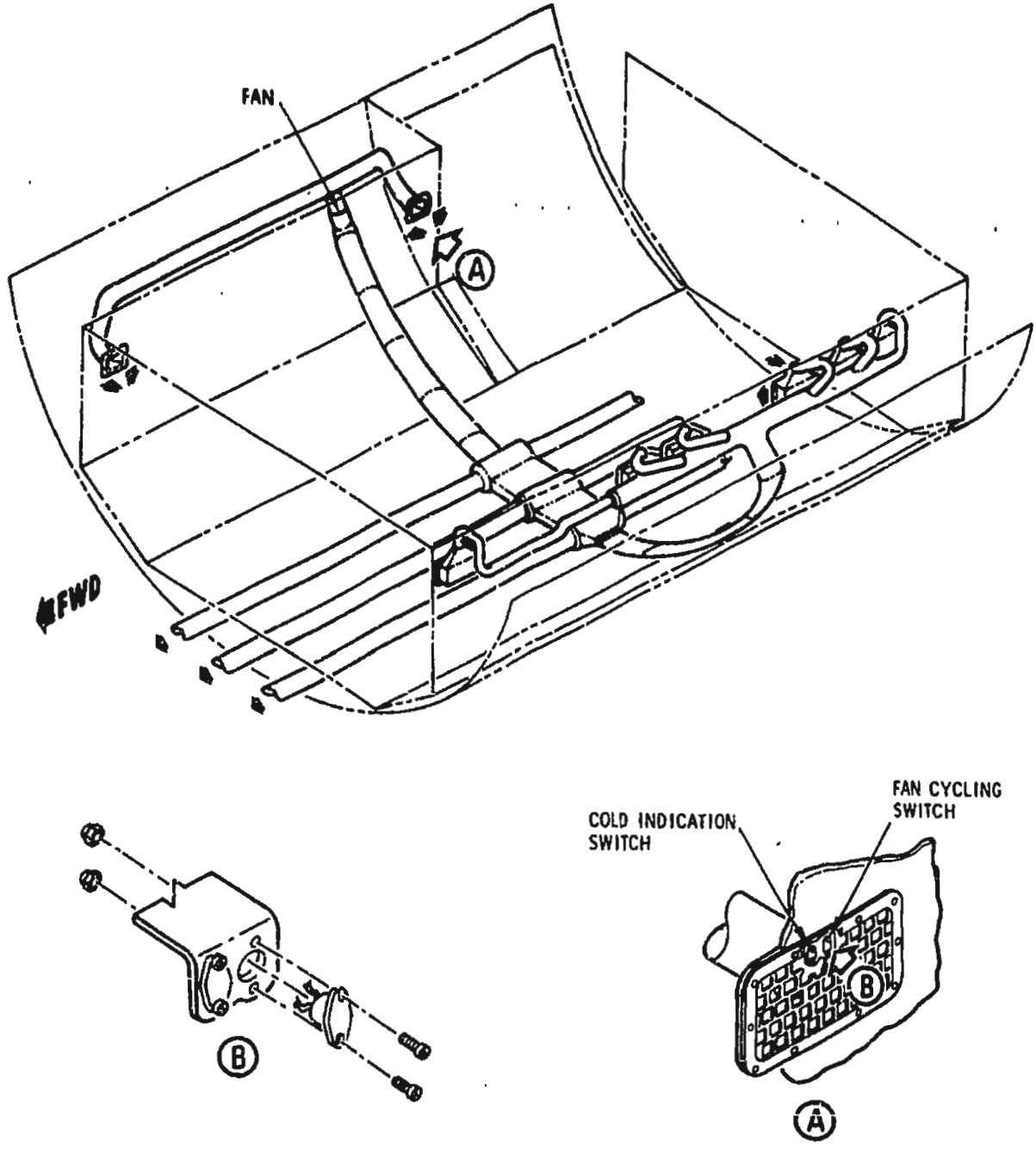
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

(4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



HH 8634
M1-0100-21-212

Forward Cargo Compartment Fan Cycling Switch
Removal and Installation
Figure 401

MID CARGO COMPARTMENT FAN CYCLING SWITCH REMOVAL AND INSTALLATION

1. General

R The mid cargo compartment fan cycling switch is mounted behind the aft right exhaust grille in the cargo compartment wall, zone 152. It is installed aft of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

R 25-51-06 Center Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breaker CARGO
R TEMP - FWD - MID (W9).

(2) In mid cargo compartment, remove aft right exhaust grille.

R (3) Remove cargo compartment liner panel (Ref. 25-51-06).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

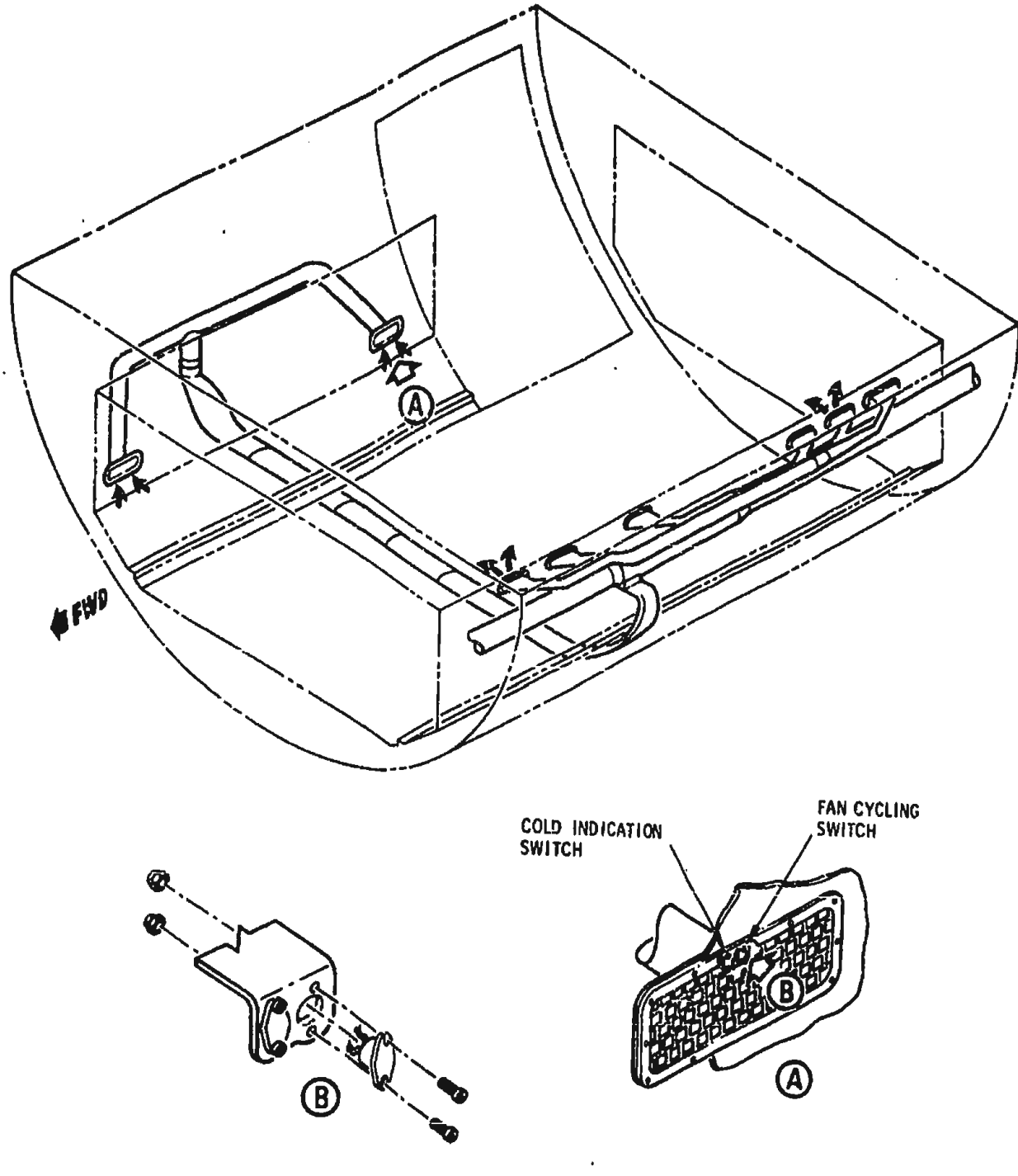
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

R (4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



HH 8635
M1-0100-21-213

Mid Cargo Compartment Fan Cycling Switch
Removal and Installation
Figure 401

AFT CARGO COMPARTMENT FAN CYCLING SWITCH REMOVAL AND INSTALLATION

1. General

R The aft cargo compartment fan cycling switch is mounted behind the center right exhaust grille in the cargo compartment wall, zone 162. It is installed aft of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

25-51-06 Aft Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CARGO TEMP - AFT (W-10).

(2) In aft cargo compartment, remove the center right exhaust grille.

(3) Remove cargo compartment liner panel (Ref. 25-51-06).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

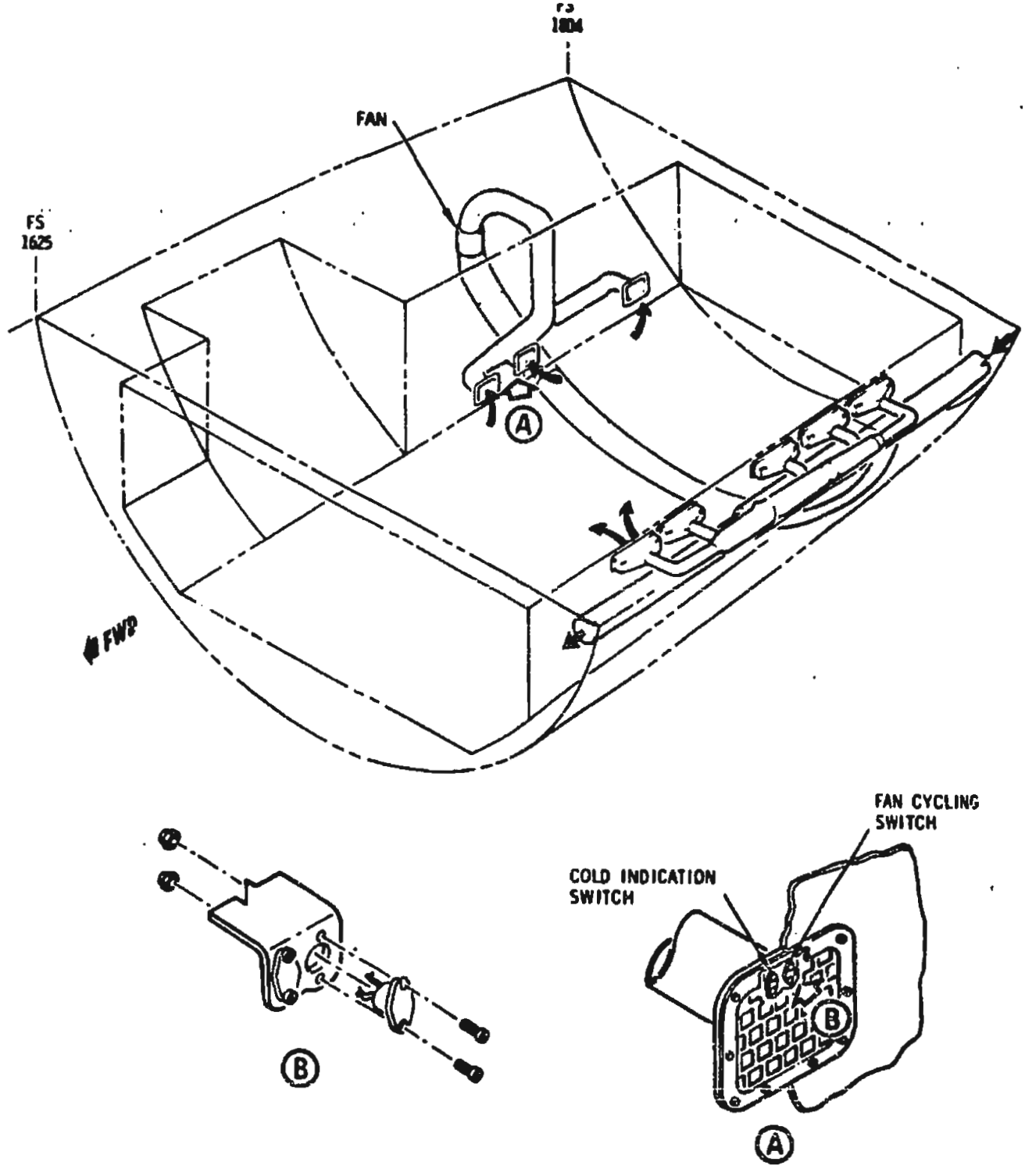
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

(4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



M1-0001-21-214

R Aft Cargo Compartment Fan Cycling Switch
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001E

CARGO COMPARTMENT OVERTEMPERATURE SWITCHES MAINTENANCE PRACTICES

1. General

NOTE: If cargo compartment ambient temperature is above 95±5 degrees F it is normal for the HOT light to be on. As soon as temperature at switch decreases to below that
R temperature the light should go off. In this event, no action is required.

When the aft cargo heat system is inoperative, due to an inoperative compartment overtemperature switch, live cargo heat requirements must be considered.

2. Maintenance Practices

A. Deactivation

(1) On galley left circuit breaker panel, zone 137, open and collar applicable circuit breaker COMPT FANS - CARGO - FWD, MID, or AFT.

(2) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, placard applicable CARGO HEAT indicator light CARGO COMPT OVERTEMP SWITCH INOPERATIVE.

(3) Make appropriate entry in aircraft log book.

FORWARD CARGO COMPARTMENT OVERTEMPERATURE SWITCH - REMOVAL AND INSTALLATION

1. General

The forward cargo compartment overtemperature switch is located in the compartment fan inlet ducting forward of the cargo door in the right cheek area outboard of the forward cargo compartment, zone 122.

2. Equipment and Materials

Protective caps

Lock-wire, Fed Spec QQ-3-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

21-44-00 Cargo Heat Systems - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CARGO TEMP FWD MID (W9).

R (2) Remove forward cargo compartment access panel 122LR.

(3) Disconnect electrical cable connector from overtemperature switch receptacle (Ref. Fig. 401).

(4) Install protective caps on cable connector and switch receptacle and stow cable to prevent damage.

(5) Cut lock-wire and unscrew switch from duct boss.

(6) Install protective cap on duct boss.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

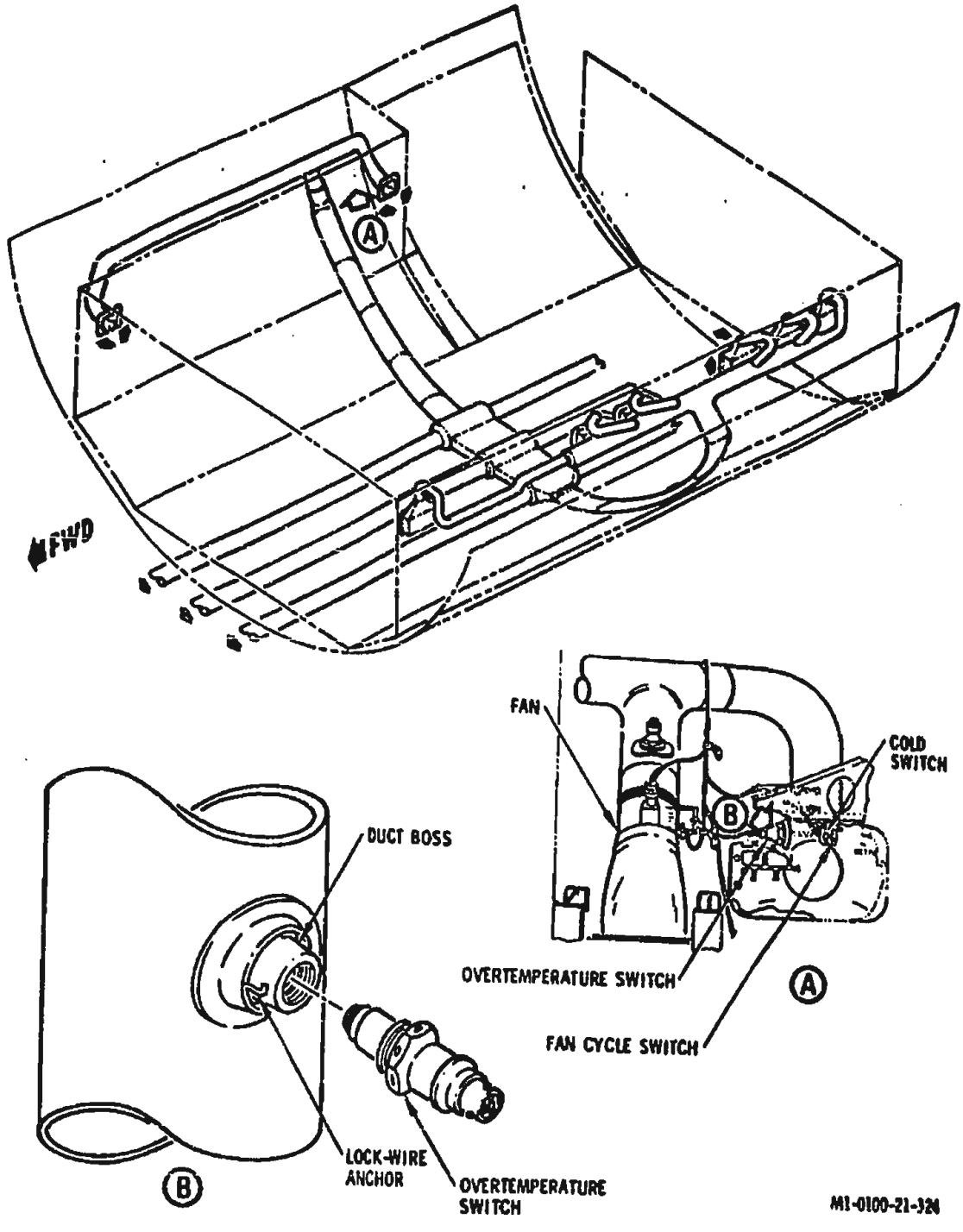
(2) Remove protective cap from duct boss, install switch and lock-wire switch to mounting boss.

(3) Remove protective caps and connect electrical cable connector to switch receptacle.

R (4) Install compartment access panel 122LR.

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Make appropriate aircraft log entry to perform functional test of overtemperature switch before or during next scheduled maintenance check [Ref. 21-44-00 CARGO HEAT SYSTEM - ADJUSTMENT AND TEST, functional test for OVERTEMPERATURE switch 4B]



Forward Cargo Compartment Overtemperature Switch
Removal and Installation
Figure 401

MID CARGO COMPARTMENT OVERTEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. General

The mid cargo compartment overtemperature switch is located in the right cheek area outboard of the mid cargo compartment, zone 152. It is approximately 12.5 feet aft of the compartment forward bulkhead.

2. Equipment and Materials

Protective caps

Lock-wire, Fed Spec QQ-3-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

R 25-51-06 Mid Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breaker CARGO
R TEMP - FWD - MID (W9).

R (2) Remove mid cargo compartment liner (Ref. 25-51-06)
R between FS1463 and FS1480.

(3) Disconnect electrical cable from overtemperature switch (Ref. Fig. 401).

(4) Install protective caps on cable connector and switch receptacle.

(5) Unscrew switch from duct boss.

(6) Install protective cap on duct boss.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

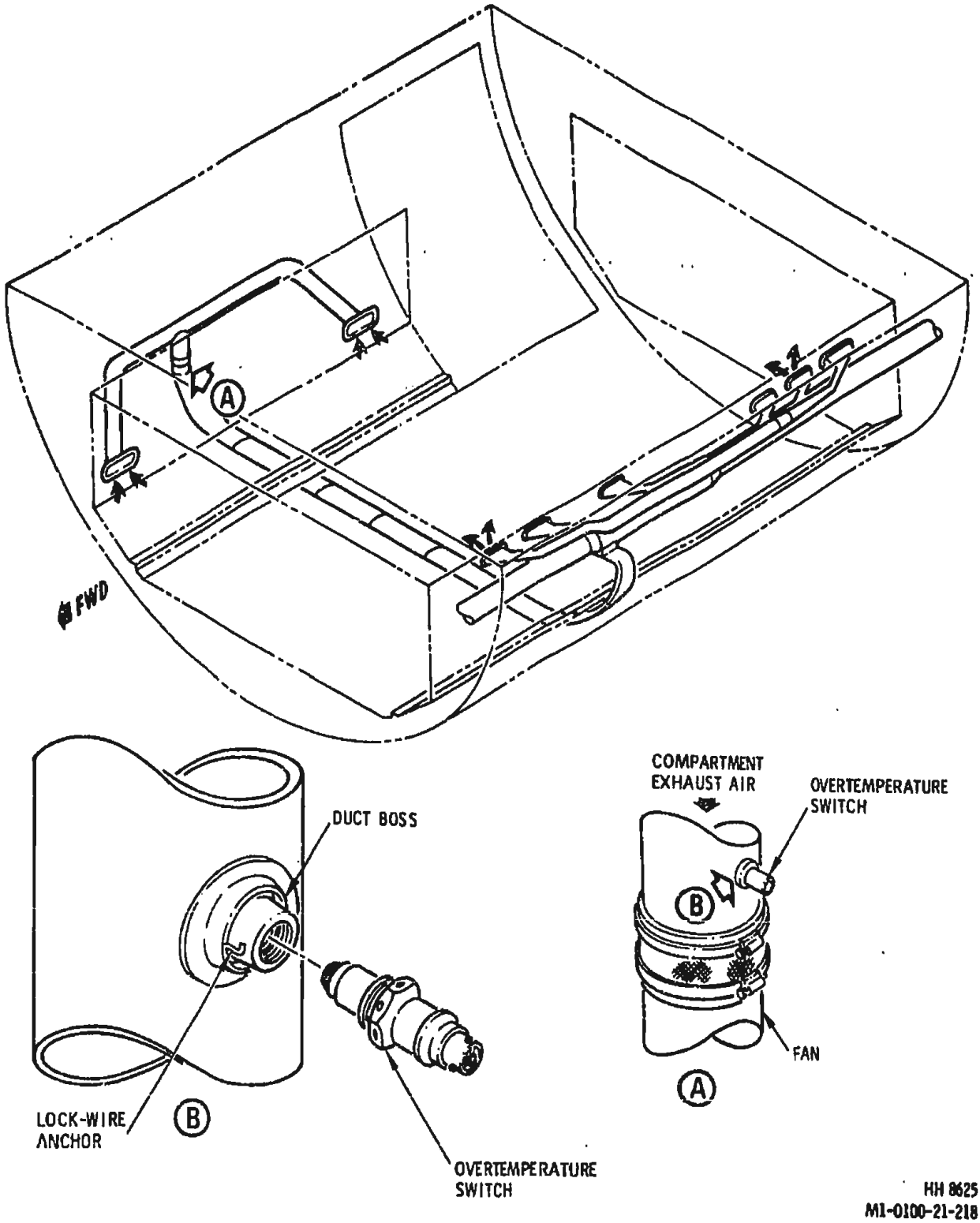
(2) Remove protective cap from duct boss, install switch and lock-wire.

(3) Remove protective caps and connect electrical cable to switch.

R (4) Install compartment liner panel (Ref. 25-51-06).

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Make appropriate aircraft log entry to perform functional test of overtemperature switch before or during next scheduled maintenance check [Ref. 21-44-00 CARGO HEAT SYSTEM - ADJUSTMENT AND TEST. Functional test for OVERTEMPERATURE switch 4B].



Mid Cargo Compartment Overtemperature Switch
Removal and Installation
Figure 401

AFT CARGO COMPARTMENT OVERTEMPERATURE SWITCH REMOVAL AND INSTALLATION

1. General

The aft cargo compartment overtemperature switch is located in the right cheek area outboard of the aft cargo compartment, zone 162.

2. Equipment and Materials

Protective caps

Lock-wire, Fed Spec QQ-3-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

R 6-50-00 Interior Panels, Aft Cargo Compartment

25-51-06 Aft Cargo Compartment Liner Panels - Removal and Installation

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CARGO TEMP - AFT (W-10).

R R (2) Remove aft cargo compartment access panel 162FR-1 (Ref. 25-51-06).

(3) Disconnect electrical cable from overtemperature switch (Ref. Fig. 401).

(4) Install protective caps on cable connector and switch receptacle.

(5) Unscrew switch from duct boss.

(6) Install protective caps on duct boss.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

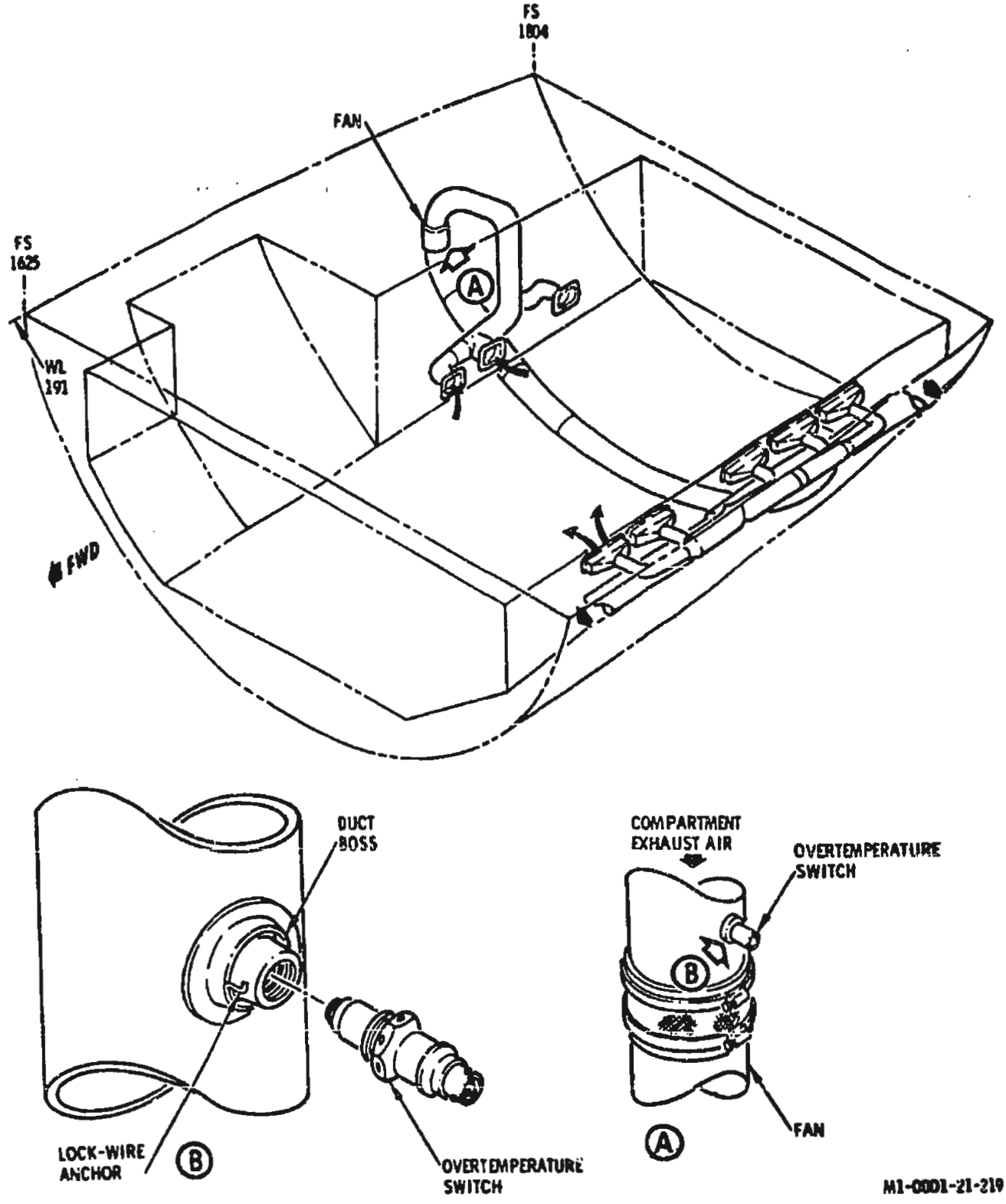
(2) Remove protective cap from duct boss, install switch and lock-wire.

(3) Remove protective caps and connect electrical cable to switch.

R (4) Install compartment access panel (Ref. 25-51-06).

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Make appropriate aircraft log entry to perform functional test of overtemperature switch before or during next scheduled maintenance check [Ref. 21-44-00 CARGO HEAT SYSTEM-ADJUSTMENT AND TEST. Functional test for OVERTEMPERATURE switch 4B].



Aft Cargo Compartment Overtemperature Switch
Removal and Installation
Figure 401

CARGO COMPARTMENT COLD INDICATION SWITCHES MAINTENANCE PRACTICES

1. General

NOTE: If cargo compartment ambient temperature is below 45±5 degrees F it is normal for the COLD light to be on. As soon as temperature at switch increases to above that
R temperature the light should go off. In this event no action is required.

2. Maintenance Practices

A. Deactivation

(1) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, placard applicable CARGO HEAT indicator light CARGO COMP COLD INDICATION SWITCH INOPERATIVE.

(2) Make appropriate entry in aircraft log book. No further action is required.

FORWARD CARGO COMPARTMENT COLD INDICATION SWITCH - REMOVAL AND INSTALLATION

1. General

The forward cargo compartment cold indication switch is mounted behind the aft right exhaust grille in the cargo compartment wall, zone 122. It is installed forward of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

25-51-06 Forward Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker CARGO TEMP - FWD MID.

(2) In forward cargo compartment, remove aft right exhaust grille.

(3) Remove cargo compartment liner panel (Ref. 25-51-06).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

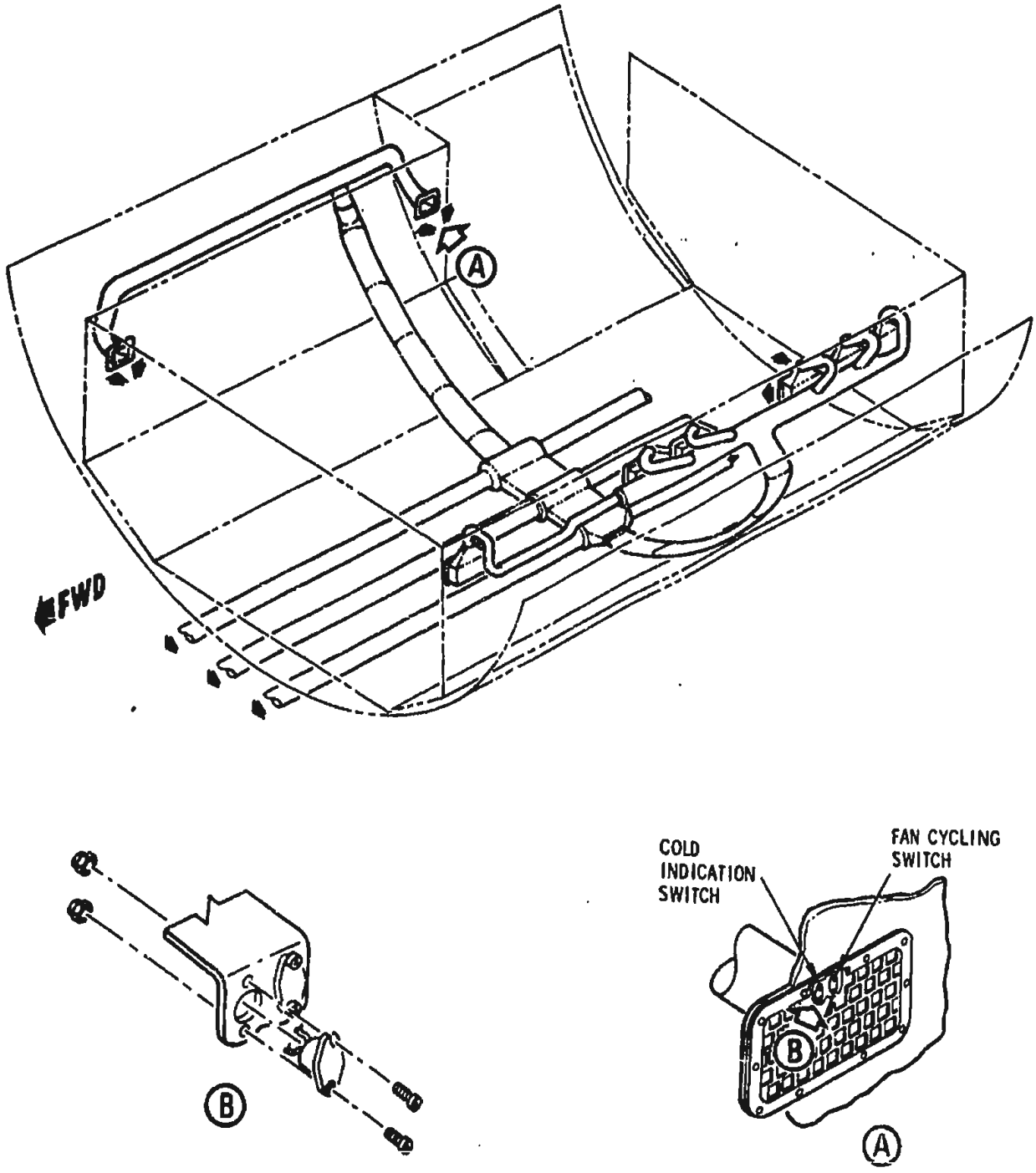
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

(4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



HH 8632
M1-0100-21-222

Forward Cargo Compartment Cold Indication Switch
Removal and Installation
Figure 401

MID CARGO COMPARTMENT COLD INDICATION SWITCH REMOVAL AND INSTALLATION

1. General

The mid cargo compartment cold indication switch is mounted behind the aft right exhaust grille in the cargo compartment wall, zone 152. It is installed forward of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

R 25-51-06 Mid Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breaker CARGO
R TEMP - FWD - MID (W9).

(2) In mid cargo compartment, remove aft right exhaust grille.

R (3) Remove cargo compartment liner panel (Ref. 25-51-06).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

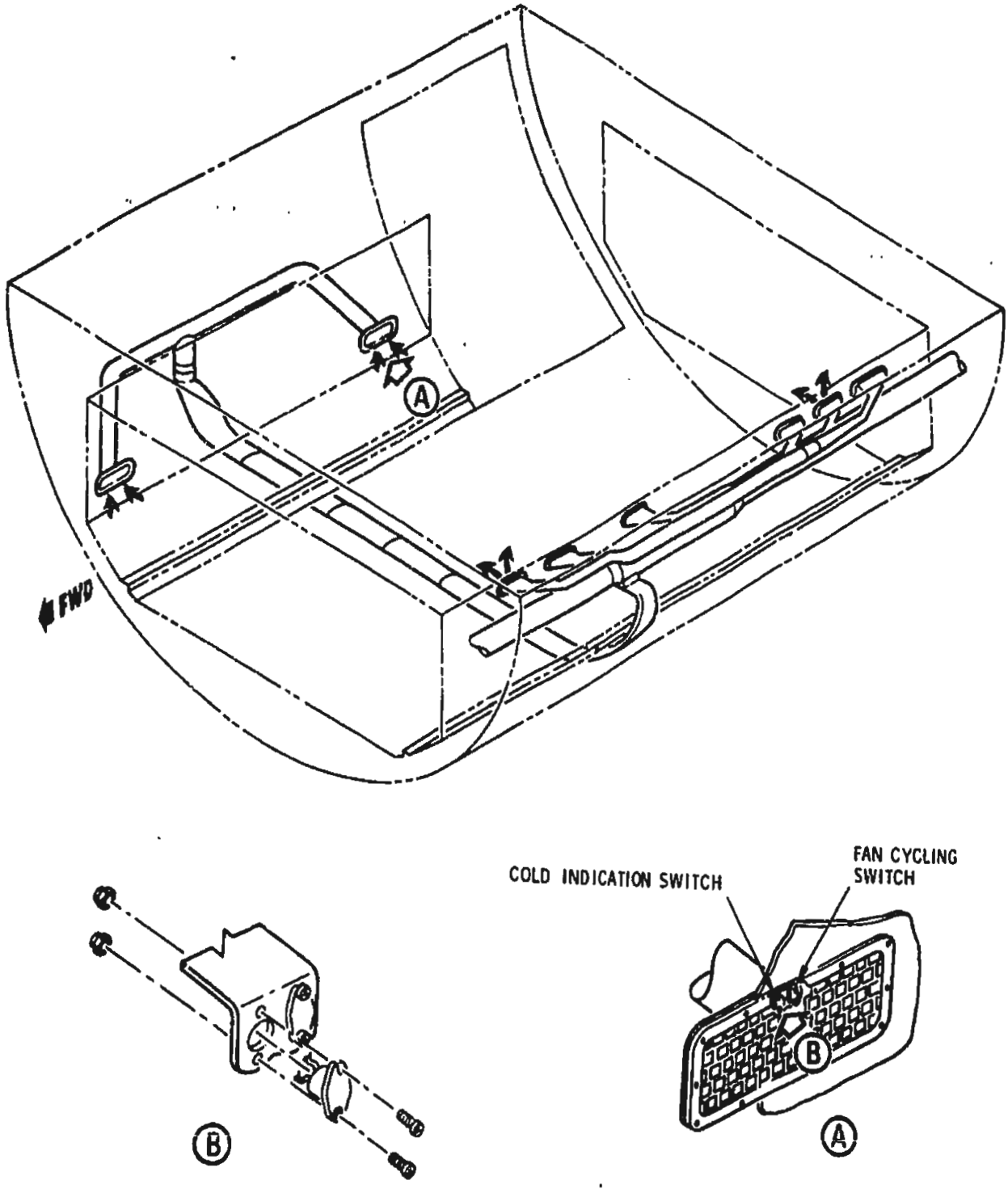
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

R (4) Install cargo compartment liner panel (Ref. 25-51-06).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



HH 8633
M1-0100-21-223

Mid Cargo Compartment Cold Indication Switch
Removal and Installation
Figure 401

AFT CARGO COMPARTMENT COLD INDICATION SWITCH REMOVAL AND INSTALLATION

1. General

The aft cargo compartment cold indication switch is mounted behind the center right exhaust grille in the cargo compartment wall, zone 162. It is installed forward of a physically identical switch in the same mounting bracket (Ref. Fig. 401). The switch wires are routed through a hole in the top of the exhaust duct to a terminal module.

2. Referenced Procedure

25-51-10 Aft Cargo Compartment Liner Panels - Removal and Installation

3. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breaker CARGO TEMP - AFT (W10).

(2) In aft cargo compartment, remove the center right exhaust grille.

(3) Remove cargo compartment liner panel (Ref. 25-51-10).

(4) Remove switch wires from terminal module.

(5) Remove switch from mounting bracket and pull switch wires through hole in exhaust duct.

B. Installation

(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

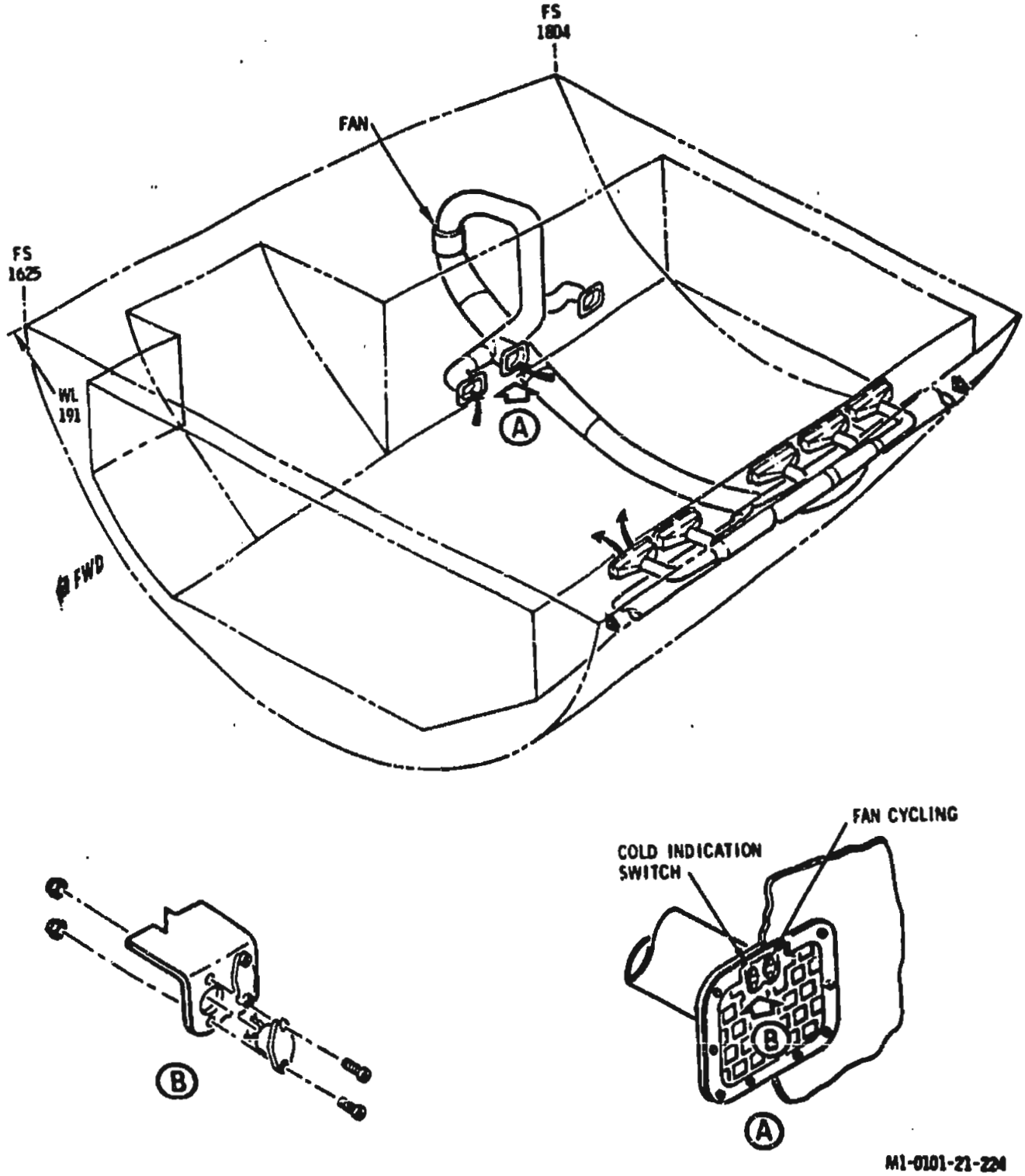
(2) Install switch in mounting bracket.

(3) Feed switch wires through hole in top of exhaust duct and connect to terminal module.

(4) Install cargo compartment liner panel (Ref. 25-51-10).

(5) Install exhaust grille.

(6) Remove tag and close circuit breaker opened in Step 3A(1).



R Aft Cargo Compartment Cold Indication Switch
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

AIR CYCLE SYSTEM - DESCRIPTION AND OPERATION

1. General

The air cycle system consists of three systems. Each system is part of one of the three air cycle packs (Ref. Fig. 1). The packs cool air conditioning system supplies air taken from the pneumatic system (Ref. 36-00-00). In addition to air cycle system components, each pack includes components in the air conditioning supply system (Ref. 21-21-00) and the temperature controlling air cycle pack control system (Ref. 21-62-00). The three systems join at the cold air plenum which is also described in this section.

All major components in each of the above systems are interchangeable between packs. See Table 1.

Air Cycle System Components
Table 1

	COMPONENT	SUBSYSTEM
	Compressor Overtemperature Switch	21-21-00
	Pack Discharge Overtemperature Switch	21-21-00
	Air Cycle Machine	21-51-00
	Bellmouth Inlet	21-51-00
	Compressor Bypass Check Valve	21-51-00
	Dual Heat Exchanger	21-51-00
	Pack Discharge Check Valve	21-51-00
	Ram Cooling Header and Check Valve	21-51-00
	Water Aspirator	21-51-00
	Water Separator	21-51-00
	Pack Discharge Temperature Sensor	21-62-00
R	On aircraft without SB21-115, Pack Ice Sensor	21-62-00
	Ram Air Exhaust Valve	21-62-00

Air Cycle System Components (Cont)
Table 1

COMPONENT	SUBSYSTEM
Ram Air Inlet Door	21-62-00
Ram Air Exhaust Actuator	21-62-00
Turbine Bypass Valve	21-62-00

All air cycle system components are installed in the unpressurized compartments on each side of the nosewheel well.

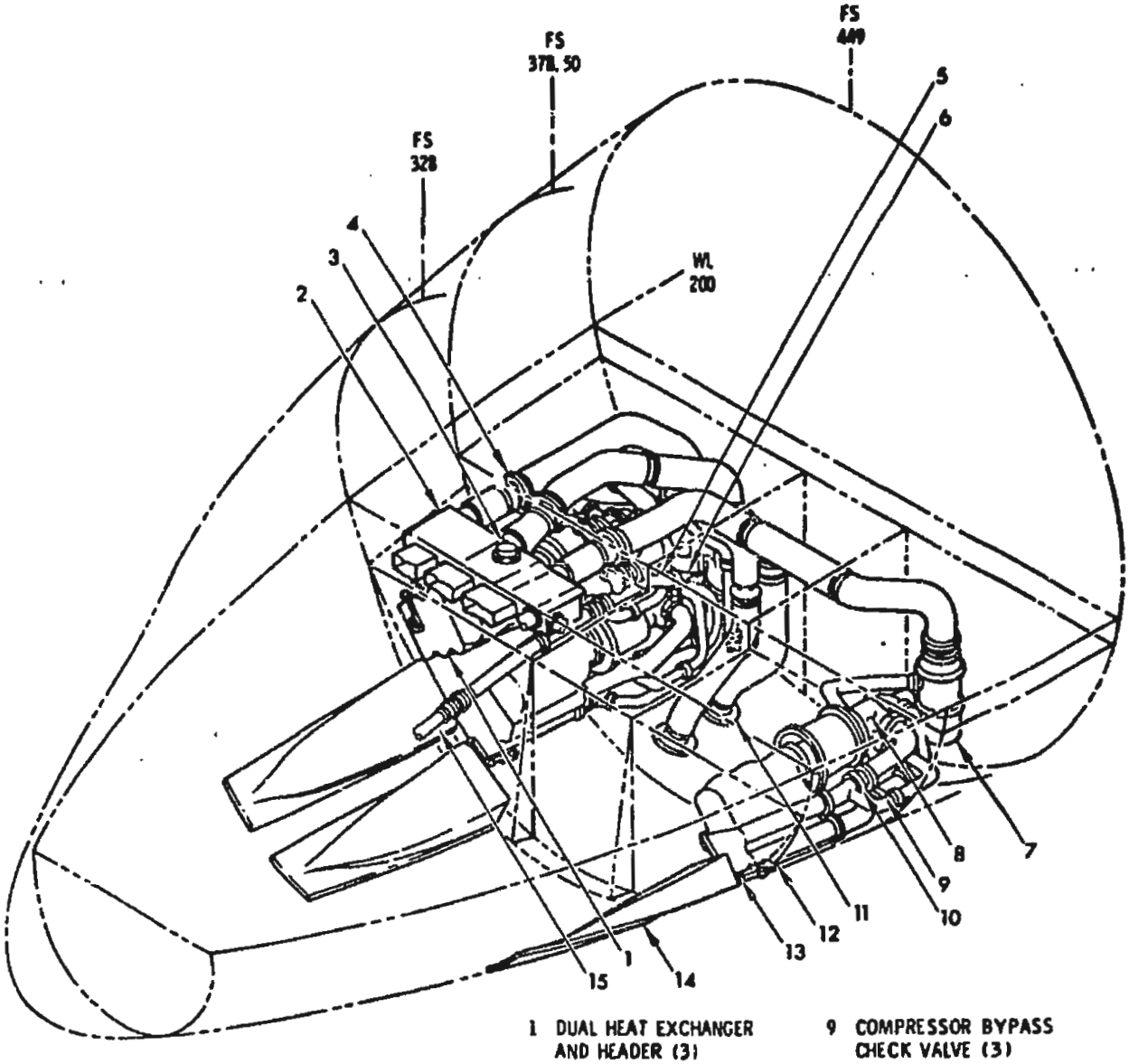
R The cold air plenum is located under the passenger cabin floor
R near the R1 door above the right ECS compartment, (Ref. Fig. 1).

The No. 1 system dual heat exchanger and the ram air inlet header and check valve are in the left heat exchanger compartment, zone 115, and those for systems No. 2 and No. 3 are in the right heat exchanger compartment, zone 116. The water aspirators are mounted one in each ram air inlet header. These compartments are outboard of the forward half of the nose wheel well. The right compartment is divided by a longitudinal bulkhead between the No. 2 and No. 3 systems.

The air cycle machine, the bellmouth inlet, the compressor bypass check valve, and the water separator for system No. 1 are in the left environmental control system (ECS) compartment, zone 117, and those for systems No. 2 and No. 3, and the pack discharge check valves for all three systems, are in the right ECS compartment, zone 118. These compartments are outboard of the aft half of the nose wheel well.

Ducting to the heat exchangers and air cycle machine fan inlet and discharge connections go through the bulkhead between the ECS and heat exchanger compartments. The No. 1 system discharge air is taken from the left to the right ECS compartments through a duct at the top of the nose wheel well.

Each air cycle pack (Ref. Fig. 2) receives a quantity-controlled and pressure-limited flow of air from the pneumatic system through one of the three pack flow control valves (Ref. 21-21-00). In the No. 2 and No. 3 packs only, some of this air is used to supply the hot air manifold system (Ref. 21-41-00). This air is taken from both upstream and downstream of the primary section of these two dual heat exchangers. The amount of air taken is determined by the requirements of the temperature controlling zone trim control system (Ref. 21-61-00).



1 DUAL HEAT EXCHANGER AND HEADER (3)
2 COLD AIR PLENUM
3 COLD AIR PLENUM RELIEF VALVE
4 PACK DISCHARGE CHECK VALVES (3)
5 HOT AIR MANIFOLD
6 HOT AIR MANIFOLD ISOLATION VALVE (2)
7 WATER SEPARATOR (3)
8 AIR CYCLE MACHINE (3)
9 COMPRESSOR BYPASS CHECK VALVE (3)
10 TURBINE BYPASS CHECK VALVE (3)
11 PRECONDITIONED GROUND AIR CONNECTION (2)
12 RAM AIR EXHAUST VALVE (3)
13 RAM AIR EXHAUST VALVE ACTUATOR (3)
14 RAM AIR INLET (3)
15 TO ZONE TRIM SYSTEM

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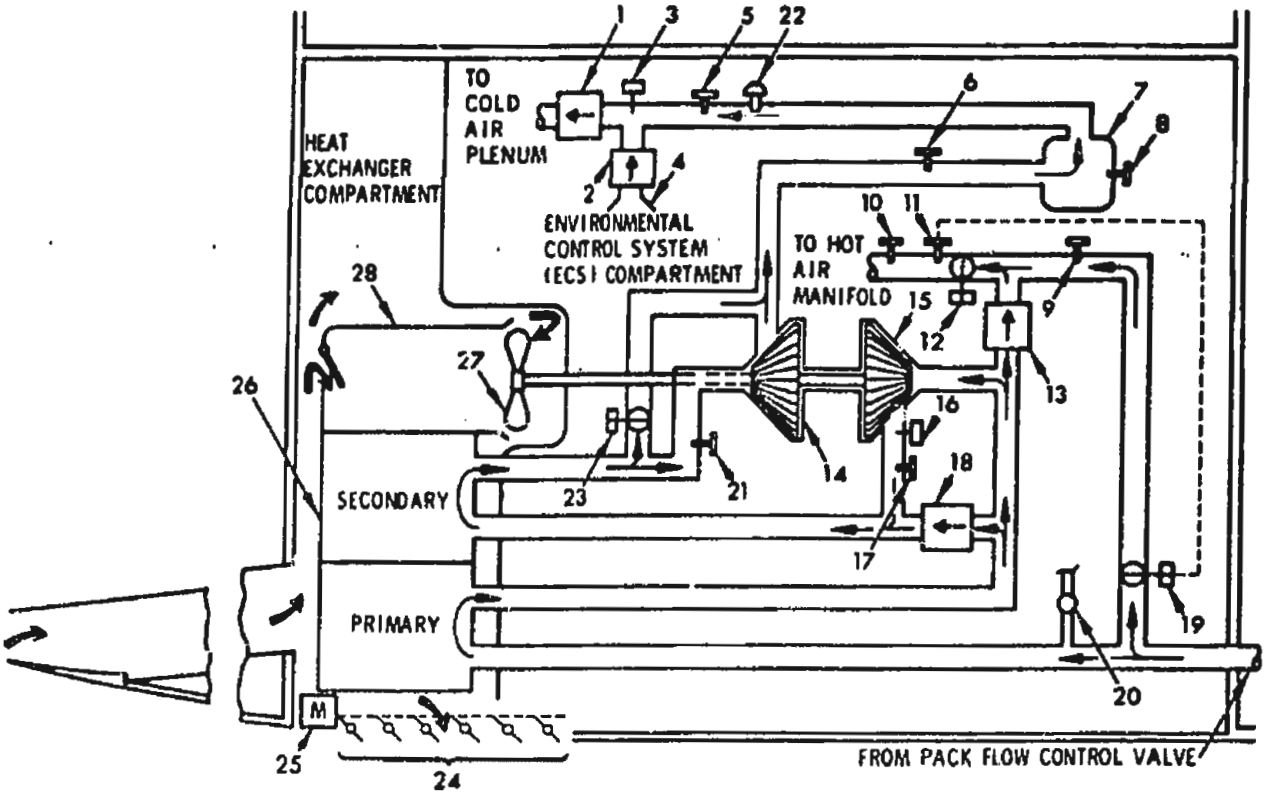
R
R

Air Cycle Packs
Figure 1

EFFECTIVITY: ALL

001B



NOTE

1. NO. 2 PACK ONLY.
2. NO. 2 AND NO. 3 PACKS ONLY.
3. NO. 3 PACK ONLY.
4. NO. 1 AND NO. 2 PACKS ONLY.

BLEED AIR FLOW

RAM AIR FLOW

1 PACK DISCHARGE CHECK VALVE.
4 2 PRECONDITIONED GROUND AIR CHECK VALVE.
3 PACK DISCHARGE OVERTEMP SWITCH.
4 4 PRECONDITIONED GROUND AIR CONNECTION.
5 PACK DISCHARGE TEMP SENSOR.
6 ACM DISCHARGE TEMP SENSOR.
7 WATER SEPARATOR.
8 ICE SENSOR.
3 9 NO. 3 HOT MANIFOLD TEMP SENSOR.
1 10 NO. 2 HOT MANIFOLD TEMP SENSOR.
2 11 HOT AIR TEMP CONTROL SENSOR.
2 12 ISOLATION VALVE.
2 13 HOT AIR MIXING CHECK VALVE.
14 ACM TURBINE.
15 ACM COMPRESSOR.
16 COMPRESSOR OVERTEMP SWITCH.
17 COMPRESSOR DISCHARGE TEMP SENSOR.
18 COMPRESSOR BYPASS CHECK VALVE.
2 19 HOT AIR TEMPERATURE CONTROL VALVE.
2 20 VHF ANTENNA ANTI-ICE (REF 30-51-00).
21 TURBINE INLET TEMP SENSOR.
22 PACK FLOW TRANSDUCER.
23 TURBINE BYPASS VALVE.
24 RAM AIR EXHAUST VALVE.
25 RAM AIR EXHAUST VALVE ACTUATOR.
26 DUAL HEAT EXCHANGER.
27 ACM FAN.
28 RAM COOLING HEADER AND CHECK VALVE.

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R
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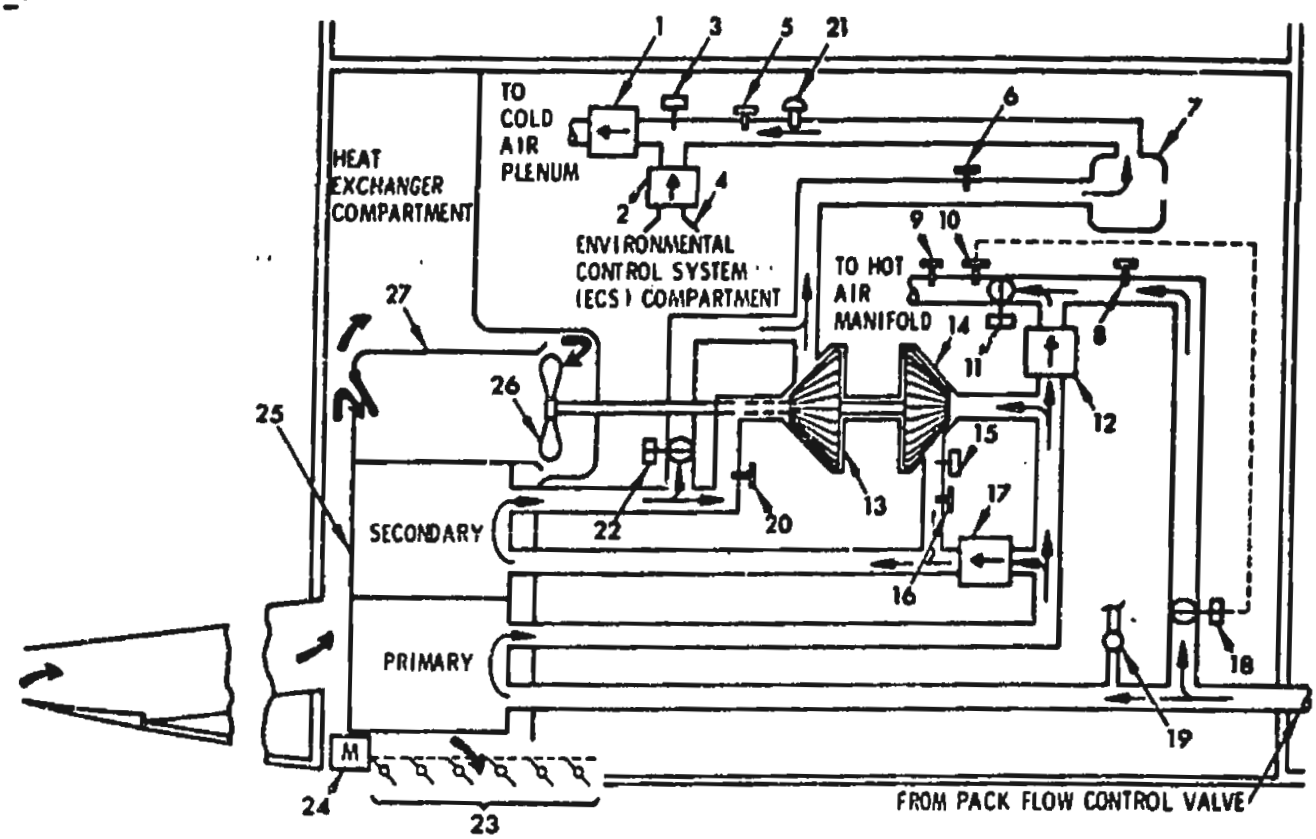
Typical Air Cycle Pack Schematic
Figure 2 (Sheet 1)

EFFECTIVITY: WITHOUT SB21-115

001B



NOTE

1. NO. 2 PACK ONLY.
2. NO. 2 AND NO. 3 PACKS ONLY.
3. NO. 3 PACK ONLY.
4. NO. 1 AND NO. 2 PACKS ONLY.

BLEED AIR FLOW

RAM AIR FLOW

1 PACK DISCHARGE CHECK VALVE.
4 2 PRECONDITIONED GROUND AIR CHECK VALVE.
3 PACK DISCHARGE OVERTEMP SWITCH.
4 4 PRECONDITIONED GROUND AIR CONNECTION.
5 PACK DISCHARGE TEMP SENSOR.
6 ACM DISCHARGE TEMP SENSOR.
7 WATER SEPARATOR.
3 8 NO. 3 HOT MANIFOLD TEMP SENSOR
1 9 NO. 2 HOT MANIFOLD TEMP SENSOR
2 10 HOT AIR TEMP CONTROL SENSOR
2 11 ISOLATION VALVE
2 12 HOT AIR MIXING CHECK VALVE
13 ACM TURBINE
14 ACM COMPRESSOR.
15 COMPRESSOR OVERTEMP SWITCH.
16 COMPRESSOR DISCHARGE TEMP SENSOR.
17 COMPRESSOR BYPASS CHECK VALVE.
2 18 HOT AIR TEMPERATURE CONTROL VALVE.
2 19 VHF ANTENNA ANTI-ICE (REF 30-51-00).
20 TURBINE INLET TEMP SENSOR.
21 PACK FLOW TRANSDUCER.
22 TURBINE BYPASS VALVE.
23 RAM AIR EXHAUST VALVE.
24 RAM AIR EXHAUST VALVE ACTUATOR.
25 DUAL HEAT EXCHANGER.
26 ACM FAN.
27 RAM COOLING HEADER AND CHECK VALVE.

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R
R

Typical Air Cycle Pack Schematic
Figure 2 (Sheet 2)

EFFECTIVITY: WITH SB21-115

001B

2. Operation

The operation of air cycle pack components that control pack discharge temperature is described in 21-62-00. Discharge temperature control is achieved through modulation of cooling airflow through the dual heat exchangers and by changes in supply air routing through components in the air cycle packs (Ref. Fig. 2). The components in the air cycle system operate in response to actions of the components in the air cycle pack control system.

In flight, the quantity of cooling airflow through the dual heat exchangers is controlled by the ram exhaust valve. Ram air from the inlet door enters the heat exchanger compartment and passes to the heat exchanger through the ram cooling header check valve. When the air cycle machine is in operation, its cooling fan takes a portion of the air from the compartment and directs it into the header, paralleling the flow from the check valve.

During ground operation, when ram air is not available, the ram air exhaust valves are fully open and cooling airflow through the heat exchangers is dependent upon air cycle machine cooling fan operation. The ram cooling header check valve remains closed during on-ground operation to direct cooling fan discharge air through the heat exchanger.

All air conditioning system supply air entering an air cycle pack passes through the primary section of the dual heat exchanger. From this point, a portion of the air (3.5-inch duct) is taken by the hot air manifold system (Ref. 21-41-00). The routing of the remaining air (6-inch duct) is controlled by the position of the turbine bypass valve.

When cooling requirements are low, and air cycle machine operation is not required, the turbine bypass valve is fully open. Supply air leaving the primary section of the dual heat exchanger passes through the compressor bypass check valve, the secondary section of the dual heat exchanger, the open turbine bypass valve, the water separator, and the pack discharge check valve into the cold air plenum.

When additional cooling is required, the turbine bypass valve is modulated toward the closed position. As this valve restricts bypass airflow around the air cycle machine turbine, air from the secondary section of the dual heat exchanger is routed through the turbine, which causes rotation of the air cycle machine turbine, the compressor, and the cooling fan.

With the air cycle machine operating, airflow through the compressor bypass check valve is reduced by the amount taken by the air cycle machine compressor from the primary section of the dual heat exchanger. Air from the compressor passes to the

inlet of the secondary section of the heat exchanger, and from that point routing is as above.

When the turbine bypass valve is fully closed to provide maximum cooling, compressor discharge pressure exceeds primary heat exchanger discharge pressure and the compressor bypass check valve is closed. With the check valve closed, all supply air is routed from the primary section of the dual heat exchanger through the air cycle machine compressor to the secondary section of the dual heat exchanger. From the secondary section, all air passes through the air cycle machine turbine to the water separator, and from the water separator air passes through the pack discharge check valve to the cold air plenum.

3. Dual Heat Exchanger

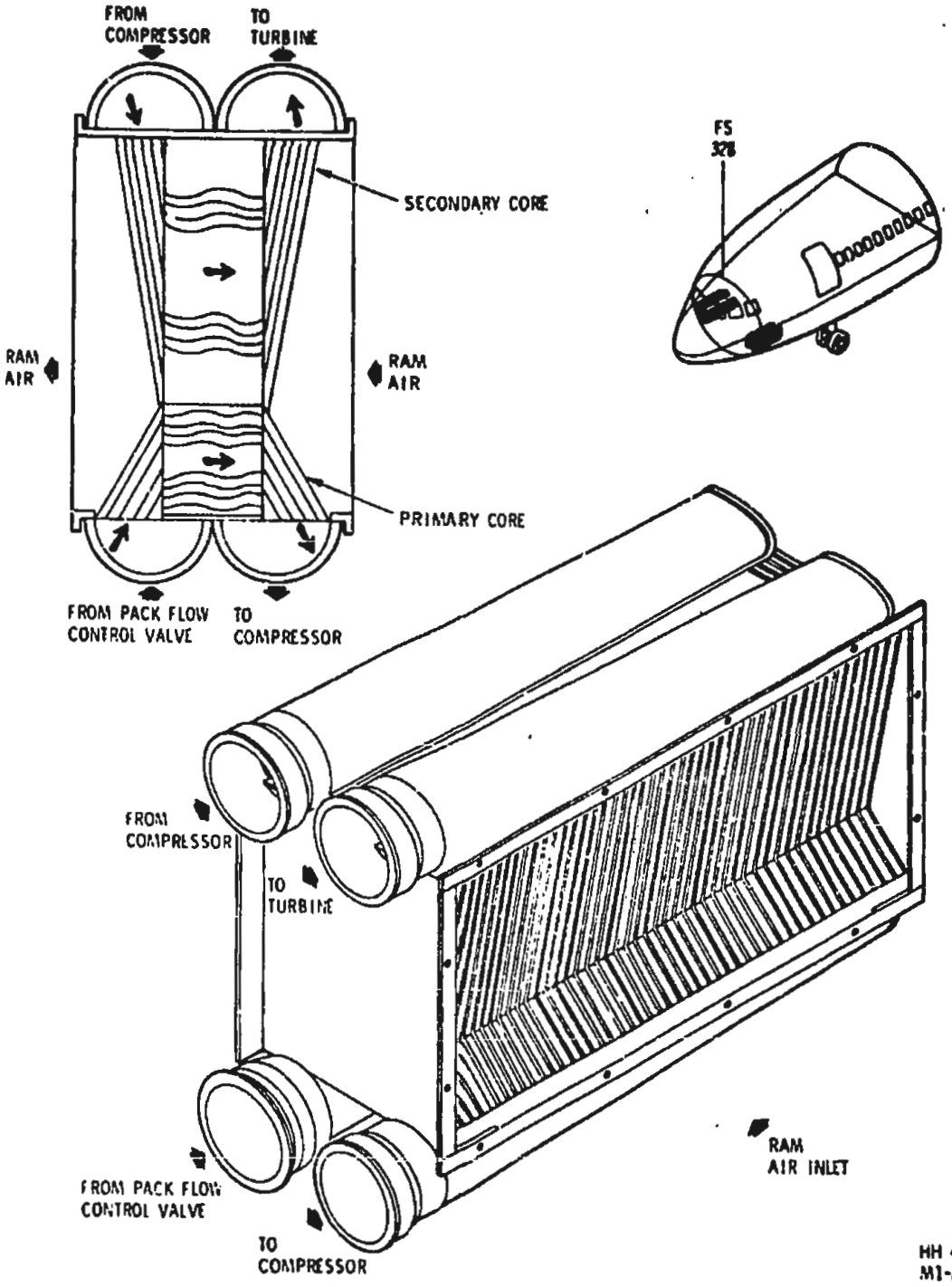
The air cycle pack dual heat exchanger is a rectangular unit of plate and fin type construction. The heat exchanger, which is a single-pass cooling air type, is longitudinally divided into primary and secondary sections; the ram cooling air passes through both sections simultaneously (Ref. Fig. 3).

The primary and secondary sections are of counterflow design. Triangular core headers, added to the main core body, permit air conditioning system air to enter and exit the two sections through four duct-attaching points at the aft end of the heat exchanger. These core headers are tapered the length of the heat exchanger to provide uniform distribution of incoming and outgoing airflow through the heat exchanger.

The function of the dual heat exchanger is to transfer heat from air conditioning system supply air to the atmospheric air flowing through it to meet cabin temperature control requirements. The amount of cooling accomplished by the heat exchanger is varied by controlling the quantity of atmospheric ram cooling airflow (Ref. 21-62-00).

Three dual heat exchangers (one in each air cycle pack) are used. The heat exchanger for the No. 1 pack is installed in the left heat exchanger compartment, zone 115, outboard of the nose wheel well. The heat exchangers for the No. 2 and No. 3 packs are installed in the right heat exchanger compartments, zone 116, outboard of the nose wheel well.

Each heat exchanger is mounted on the rectangular frame of the ram air exhaust valve (Ref. 21-62-00), which is bolted to structure, flush with fuselage exterior surface. Modified V-band flanges are used to connect one 6-inch duct and three 5.5-inch ducts at the aft end of the heat exchanger. The ram cooling header and check valve attaches to the top surface of the heat exchanger.



Dual Heat Exchanger
Figure 3

All air taken from the pneumatic system (Ref. 36-00-00) through each of three air cycle pack flow control valves (Ref. 21-21-00), except for the air used by the hot air manifold system (Ref. 21-41-00), passes through both sections of the dual heat exchanger in that pack. Temperature control of pack discharge air is achieved by controlling ram cooling airflow and by using the air cycle machine in each pack (Ref. 21-62-00).

4. Ram Cooling Header and Check Valve

The ram cooling header and check valve is a fiber glass housing with an opening at one end and a check valve at the other (Ref. Fig. 4). A ram cooling header and check valve is mounted on top of each of the three dual heat exchangers.

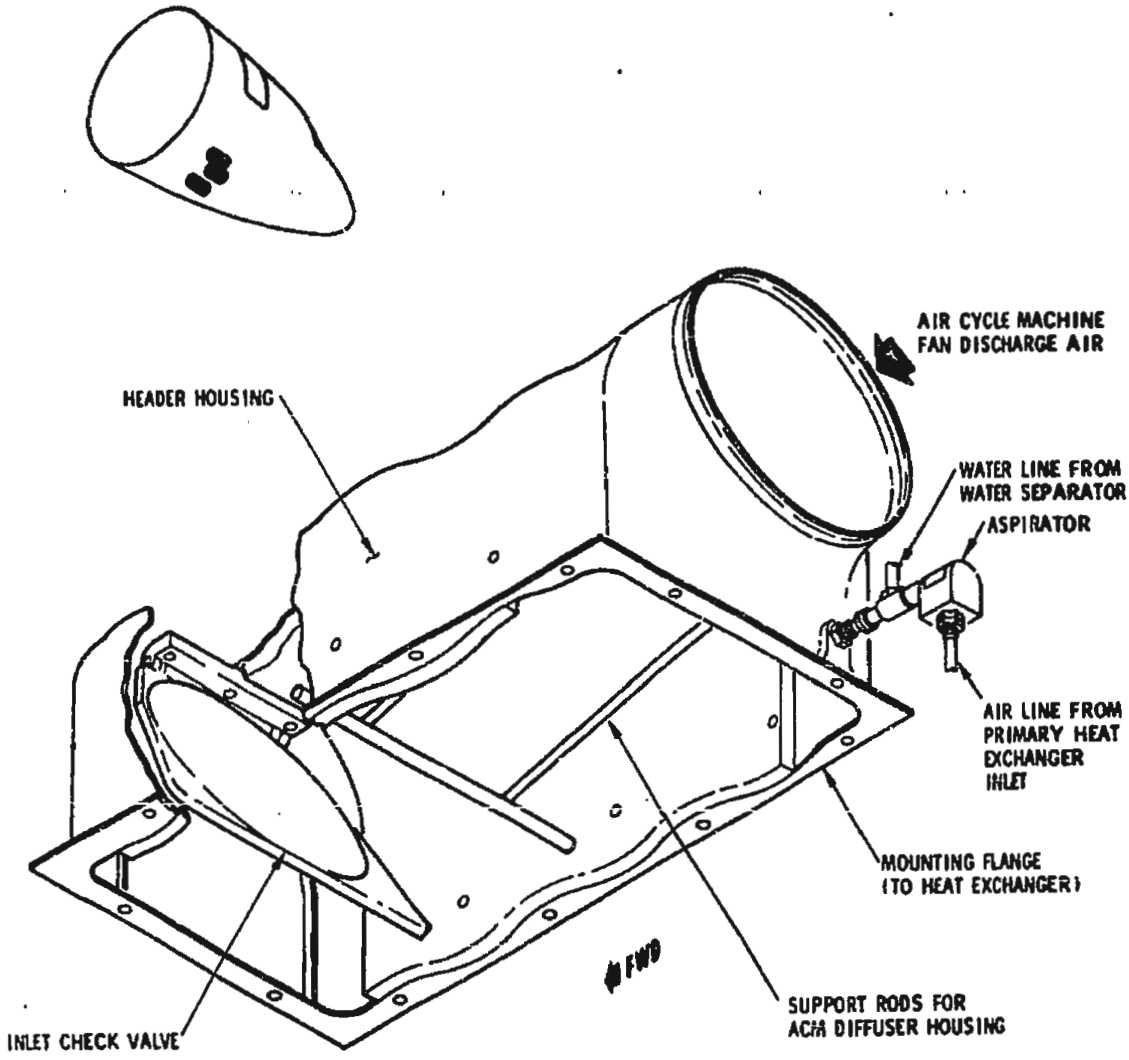
The check valve at the forward end of the housing is hinged at the top and gravity-loaded to the closed position. An open position stop at the top of the header limits check valve opening to maintain a positive pressure on the valve plate and to prevent flutter at high airflows.

The ram cooling header and check valve and dual heat exchanger assemblies are installed in the left and right heat exchanger compartments on each side of the nose wheel well. The assembly for the No. 1 air cycle pack is in the left compartment, zone 115, and the assemblies for the No. 2 and No. 3 packs are in the right compartment, zone 116.

The right heat exchanger compartment is divided into two sections by a longitudinal bulkhead between the No. 2 and No. 3 header/heat exchanger assemblies. All compartments are sealed to serve as plenum chambers for air admitted through the ram air inlet doors.

The aft end of the ram cooling header connects to the air cycle machine cooling fan discharge through an opening in the aft bulkhead. Cooling fan inlet air from the heat exchanger compartment passes around the header connection into the cooling fan inlet shroud at the aft face of the bulkhead. A fitting in the header near the heat exchanger mounting flange is used to install the water aspirator that sprays water from the water separator on the dual heat exchanger. The quantity of airflow into each heat exchanger compartment plenum, through the ram cooling header and check valve and dual heat exchanger, and overboard is controlled by the exhaust valve in each of the
R three air cycle pack control systems (Ref. 21-62-00).

R On aircraft with SB21-034,
R the aspirators are deactivated.


AIR CYCLE MACHINE FAN DISCHARGE AIR
HEADER HOUSING
WATER LINE FROM WATER SEPARATOR
ASPIRATOR
AIR LINE FROM PRIMARY HEAT EXCHANGER INLET
MOUNTING FLANGE (TO HEAT EXCHANGER)
FWD
SUPPORT RODS FOR ACM DIFFUSER HOUSING
INLET CHECK VALVE

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M1-0302-21-049

Ram Cooling Header and Check Valve
Figure 4

In flight, when the exhaust valve is open, ram air in the compartment enters the dual heat exchanger through the header check valve. During on-ground operation the exhaust valve is fully open. Compartment air is drawn into the air cycle machine cooling fan inlet and forced through the dual heat exchanger through the fan discharge connection to the header. The header check valve is held closed by gravity and by fan discharge pressure.

5. Air Cycle Machine

A. Description

The air cycle machine (ACM) is a "three-wheel" unit with a compressor, a turbine, and a cooling fan on a common shaft (Ref. Fig. 5). The shaft is supported in the housing by two ball bearing assemblies that are lubricated by wicks from the integral oil sump. The centrifugal-type compressor and turbine are mounted back-to-back on one end of the shaft, and the axial flow cooling fan is mounted on the other end of the shaft. Borescope inspection ports are provided in the lower portion of each impeller housing.

Three ACM are used; the machines are installed in the left and right environmental control system (ECS) compartments on each side of the nose wheel well. The ACM for the No. 1 air cycle pack is installed in the left compartment, zone 117, and the machines for the No. 2 and No. 3 packs are installed in the right compartment, zone 118. The machines are hung from bracket assemblies by bolts into bosses that are integral with the turbine housing of the ACM.

The compressor housing is bolted to the turbine housing and forms the aft end of the unit. The 5.5-inch-diameter compressor inlet port is in the center of the aft face. Compressor discharge is to the left (looking forward), through a 3.5-inch-diameter port at the top left of the housing. A compressor overtemperature sensing thermal switch mounting is provided near the bottom of the discharge scroll portion of the housing.

The integral oil sump is at the bottom of the turbine housing. The turbine housing, which supports both the compressor and cooling fan housings, includes three duct connection ports. The 4-inch-diameter turbine inlet port is at the lower left of the housing, and the 5.5-inch-diameter turbine discharge port is at the upper right of the housing. The third 5.5-inch-diameter port at the upper left of the housing is used to connect the turbine bypass valve to the turbine discharge port.

The cooling fan housing is at the forward end of the ACM. The fan inlet air shroud, which connects to the bulkhead between the ECS compartment and the heat exchanger compartment, passes around the outside of the cooling fan and enters the axial flow fan from the aft face. Cooling fan discharge is forward, through the fan diffuser housing within the cooling air inlet shroud.

B. Operation

The ACM begins operating when pack cooling requirements are greater than can be provided by dual heat exchanger use only. When this occurs, the air cycle pack control system (Ref. 21-62-00) begins closing the turbine bypass valve to force secondary heat exchanger discharge air to go through the ACM turbine. The degree of turbine bypass valve closure determines the amount of cooling achieved through usage of the ACM.

The following operational description assumes:

The aircraft is on the ground and maximum cooling is in use.

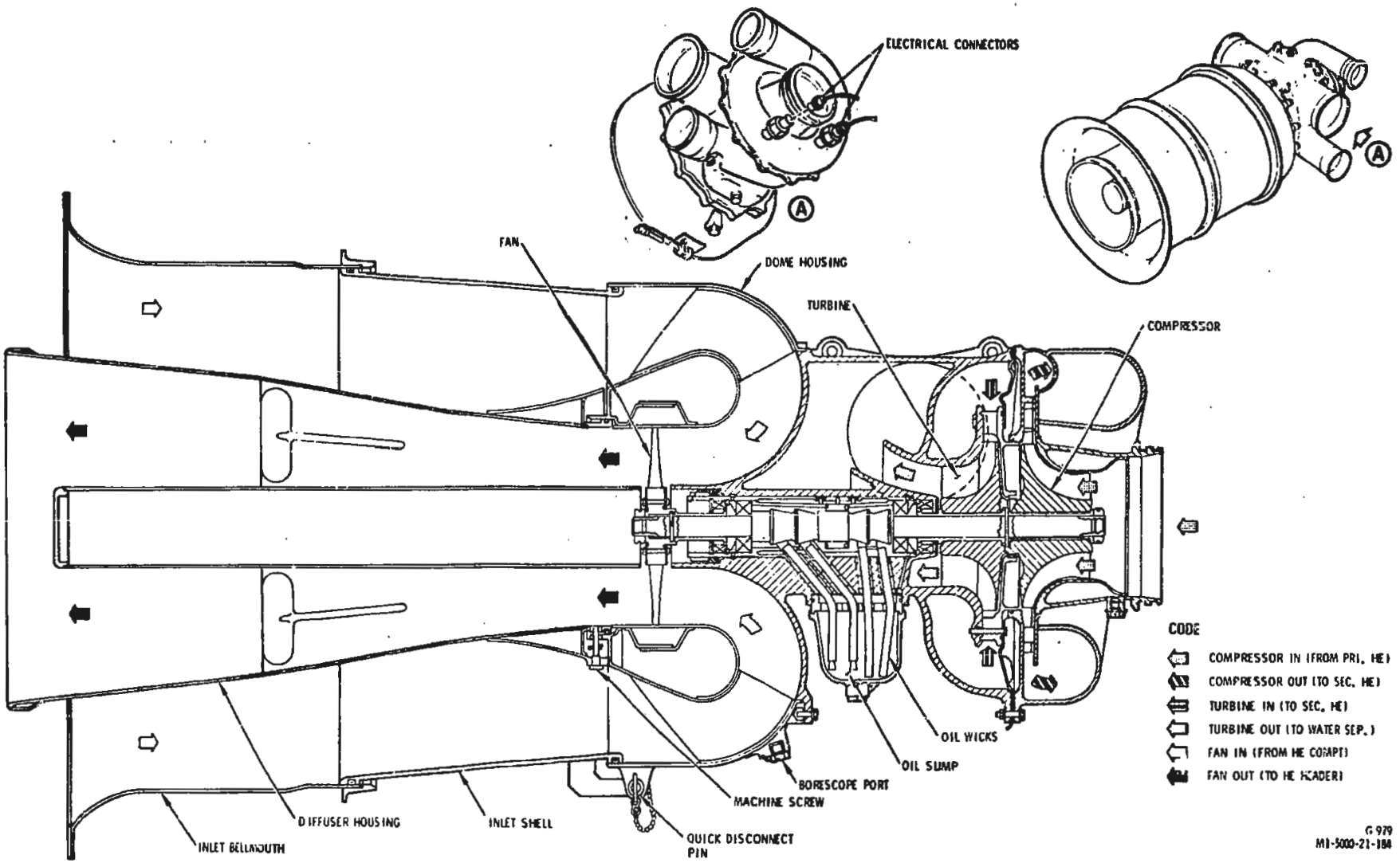
The turbine bypass valve is fully closed.

The cooling air flow controlling ram air exhaust valves are fully open.

With the turbine bypass valve closed all secondary heat exchanger discharge air is forced through the ACM turbine, causing it, together with the compressor and cooling fan, to rotate at optimum speed. The ACM compressor draws air, cooled to slightly above ambient temperature, from the primary heat exchanger discharge. This air is compressed, with a corresponding increase in temperature, and ducted to the secondary heat exchanger inlet.

In the secondary heat exchanger the air is again cooled to slightly above ambient temperature, and then ducted to the air cycle machine turbine inlet. As the air goes through the turbine (driving the turbine, compressor, and cooling fan), it expands and the pressure decreases to slightly above cabin pressure with a corresponding temperature decrease. The temperature decrease (upon expansion) is roughly equivalent to the temperature increase for compression.

Since the cooling fan is driven by the turbine when the ACM is in use, the fan draws air from the heat exchanger compartment and forces it through the ram cooling air header



Air Cycle Machine
Figure 5

and the dual heat exchanger to maintain cooling airflow comparable to that supplied by ram air in flight.

Modulated use of the ACM, as controlled by partial closing of the turbine bypass valve, varies the quantity of air going through the air cycle machine versus that going directly from the primary heat exchanger discharge to the secondary heat exchanger inlet.

In flight, use of the ACM is the same as for on-ground use, differing only in the amount of opening of the ram air exhaust valve and in the load upon the cooling fan. With ram air pressure available to provide dual heat exchanger cooling airflow, the cooling fan functions only as a workload on the turbine.

6. Compressor Bypass Check Valve

The compressor bypass check valve is a 5.5-inch-diameter, six-sector, disc-type check valve. Each of the six pie-cut-shaped valve flappers is hinged at the outer perimeter and spring-loaded to close. The valve seats form a six-armed cross through the center of the valve.

Six semi-hard bumpers around the inside of the valve housing provide flapper open position stops. The bumpers are located so that the center of the flapper contacts the stop to limit hinge stress. The bumpers hold the flapper up in the airstream to maintain a positive air pressure on the flapper to prevent flutter.

The function of this valve is two-fold. When cooling requirements are low, and the air cycle machine (ACM) is not in use, the compressor bypass check valve passes primary heat exchanger discharge air directly to the secondary heat exchanger inlet. As cooling requirements increase, the turbine bypass valve closes and the ACM begins operating. When air cycle machine compressor discharge pressure becomes greater than primary heat exchanger discharge pressure, the compressor bypass check valve closes to prevent recirculation of compressor discharge air back to the compressor inlet (Ref. Fig. 1).

The three compressor bypass check valves are installed in the ducting below the ACM in each air cycle pack. The valve for the No. 1 pack is in the environmental control system (ECS) compartment to the left of the nose wheel well, zone 117, and the valves for the No. 2 and No. 3 packs are in the ECS compartment to the right of the nose wheel well, zone 118.

The valves are flange-mounted in the ducting by a modified V-band flange at the air entry end, and by a flexible coupling type connection at the exit end.

When the air cycle pack is in use and cooling requirements are minimal (not requiring ACM usage), the compressor bypass check valve bypasses primary heat exchanger discharge air directly to the secondary heat exchanger inlet. As cooling requirements increase and the ACM begins operating, flow of air through the check valve decrease until ACM compressor discharge pressure becomes greater than primary heat exchanger discharge pressure.

7. Pack Discharge Check Valve

The air cycle pack discharge check valve is an 8-inch-diameter, six-sector, disc-type check valve. Each of the six pie-cut-shaped flappers is hinged at the outer perimeter and spring-loaded to close. The valve seats form a six-armed cross through the center of the valve.

Six semi-hard bumpers around the inside of the valve housing provide flapper open position stops. The bumpers are located so that the center of the flapper contacts the stop to limit hinge stress. The bumpers hold the flapper up in the airstream to maintain a positive air pressure on the flapper to prevent flutter.

A valve is used for each of the three air cycle packs. The valves installed in the ducts connecting the air cycle pack water separators to the cold air plenum in the right environmental control system (ECS) compartment on the right side of the nose wheel well, zone 118. The valves prevent loss of cabin air pressure in the event a duct or a component ruptures in an air cycle pack system.

The valves are flange-mounted in the ducting by a modified V-band flange at the air exit end, and by a flexible coupling connection at the entry end.

When an air cycle pack is in use, pack discharge air from the water separator to the cold air plenum pushes the check valve flappers open against spring pressure. When a pack is not in use, the flapper springs close the valve. If a duct or a component rupture in an air cycle pack, the pack discharge check valve for that pack prevents loss of cabin pressure.

8. Water Separator

The water separator is a barrel-shaped unit containing a coalescer, a vortex generator, a moisture collector, and a

bypass valve in a tubular assembly mounted coaxially in the main housing. The main housing, vortex generator, and moisture collector are constructed of fiber-glass-reinforced plastic. The separator is mounted vertically. Air cycle pack discharge air enters through a duct connection on the side of the barrel and leaves through a connection on the top of the separator. The bottom one-fourth of the main housing is detachable (retained by a V-band clamp) to provide easy access to the coalescer (Ref. Fig. 6).

A mounting plate on the side of the main housing includes four inserts to attach an ice sensor or blocking plate and two flush-type ports for connecting an ice sensor to the water separator inlet and discharge pressure pickups.

On aircraft without SB21-115,
the pack ice sensor is used by the pack temperature control
R system (Ref. 21-62-00).

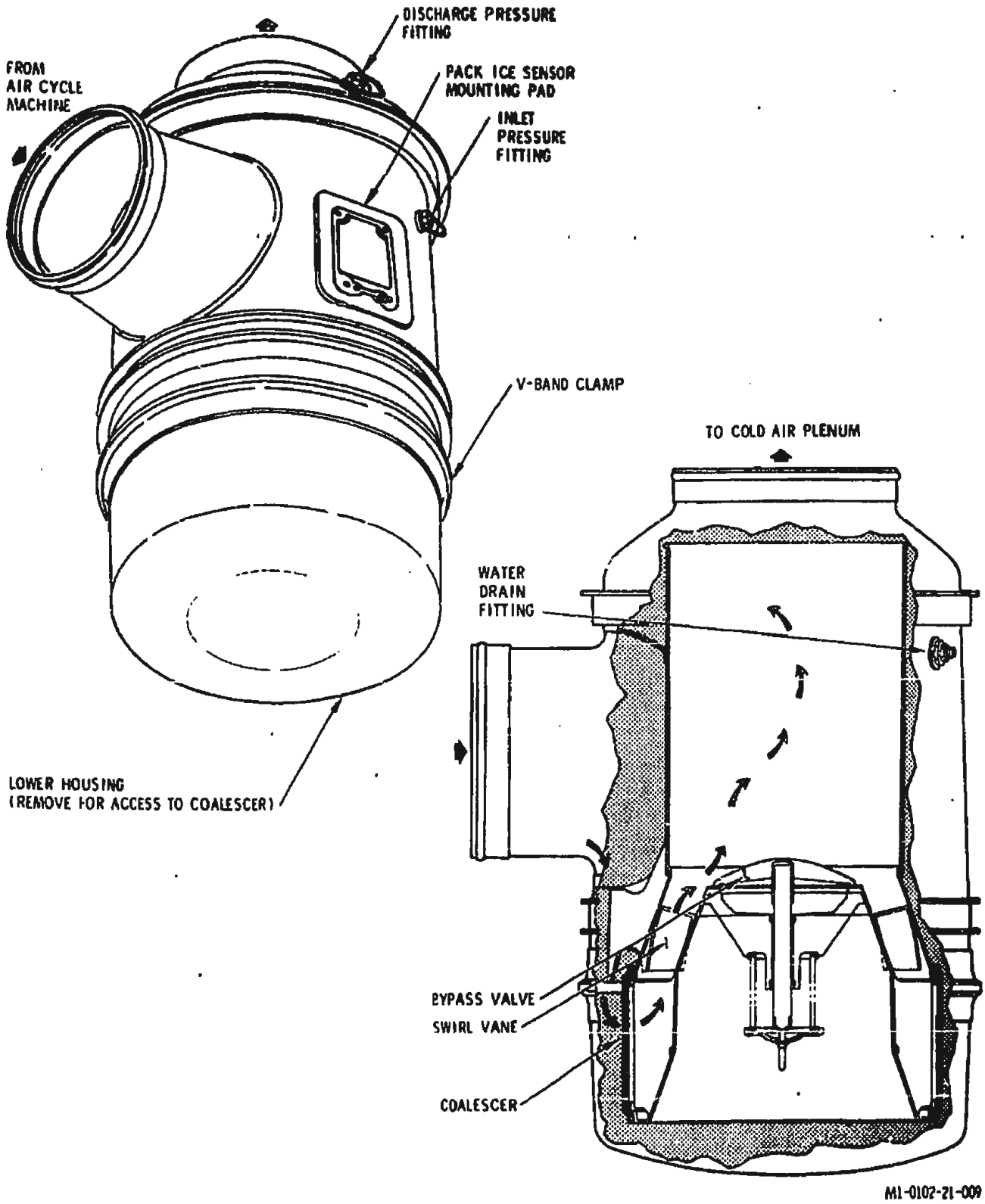
R On aircraft without SB21-034,
R a water drain boss connection on the side of the housing is
R connected to the water aspirator.

R On aircraft with SB21-034,
R a water drain boss connection on the side of the housing is
R connected to an overboard drain line connected to flush
R discharge fittings below the water separator.

R The water separator removes excess moisture from air cycle pack discharge air before it enters the cold air plenum. A separator is installed in each of the three air cycle pack systems. The water separators are installed on the forward face of the bulkhead at the aft end of the environmental control system compartments on each side of the nose wheel well. The separator for pack No. 1 is in the left compartment, zone 117, and the separators for packs No. 2 and No. 3 are in the right compartment, zone 118.

Air cycle pack discharge air entering the water separator passes into an annular chamber surrounding the tubular moisture collector and vortex generator assembly, and then passes downward to the wide belt-shaped fiberglass fabric coalescer. The bypass relief valve is at the bottom of the internal assembly in the coalescer support. In the event of blockage of the coalescer, the spring-loaded bypass valve opens to allow airflow through the water separator (bypassing the coalescer) when inlet air pressure is more than 3.0 psi greater than discharge pressure.

Normally, air passes through the coalescer which causes entrained moisture to coalesce or condense into water droplets. These droplets are then carried from the inside surface of the



Water Separator
Figure 6

coalescer into the vortex generator. The vortex generator imparts a rapid swirling motion to the air moving upward. The water is expelled outward against the moisture collector and into the scupper leading to the water drain port. Air pressure forces the water through the drain port. The now drier air leaves the water separator through the duct connection at the top of the separator.

R 9. Water Aspirator

R On aircraft with SB21-034,
R the water aspirator is deactivated.

The water aspirator is an ejector assembly that sprays water removed from air cycle pack discharge air by the water separator. The water is sprayed into the cooling airstream entering the dual heat exchanger to supplement heat exchanger cooling.

An aspirator is used in each of the three air cycle pack systems. The aspirators are installed in the ram air inlet header on top of each dual heat exchanger. The aspirator for pack No. 1 is installed in the left heat exchanger compartment, zone 115, and the aspirators for packs No. 2 and No. 3 are installed in the right compartment, zone 116.

The water drain line from the water separator in each air cycle pack system is connected to the side of the T-shaped water aspirator. Air from the secondary heat exchanger discharge goes to the aspirator air inlet port. The ejector discharge port connects directly into the lower aft corner of the ram air inlet header to discharge the air-driven water across the cooling air inlet face of the dual heat exchanger.

Air, at air cycle machine turbine inlet pressure, enters the aspirator to pass through a converging-diverging nozzle. The water is drawn by venturi action from the water separator through four radial holes just downstream of the nozzle throat. The water is dispersed through a fine spray and ejected across the cooling air inlet face of the dual heat exchanger. The heat required to evaporate this water increases the cooling capacity of the heat exchanger.

10. Cold Air Plenum

The cold air plenum collects air from each of the three air cycle packs and redistributes it evenly to outlet ducts leading to the areas on the aircraft requiring conditioned air.

The plenum contains only one moving part, the plenum relief valve. Inside the plenum chamber is a baffle dividing the chamber in two laterally and vertically. It is designed to cause even airflow through the plenum so that if any one of the three packs fail, no area suffers a deficiency.

Two drain lines lead from the bottom of plenum to drain off moisture that condensates inside the plenum chamber. These drain lines lead to the drain lines for the lower ECS distribution system (Ref. 21-23-00,001).

11. Cold Air Plenum Relief Valve

The cold air plenum relief valve is a 6-inch-diameter, four-sector, disc-type relief valve. Each of the four quarter-disc valve flappers is hinged at the outer perimeter and spring-loaded to the closed position. The valve seats form a 90-degree cross through the center of the valve.

Four semi-hard bumpers around the inside of the valve housing provide flapper open position stops. The bumpers are located so that the center of the flapper contacts the stop to limit hinge stress. The bumpers hold the flapper up in the airstream to maintain a positive air pressure on the flapper to prevent flutter.

The cold air plenum relief valve is installed in the top surface of the cold air plenum under the forward right cabin floor above the pressure deck over the nose wheel well and the area to the right of it, zone 119. The valve is attached to the plenum by a mounting flange around the body of the valve. When the valve is open plenum air is exhausted beneath the floor and passes to the cheek areas outboard of the forward cargo.

The cold air plenum relief valve prevents excessive pressure that could rupture the reinforced fiber glass ducts in the flight station, cabin, and galley distribution systems. If pressure inside the cold air plenum becomes much greater than outside the plenum, the difference in pressure forces the valve flaps open until pressure is relieved.

AIR CYCLE SYSTEM - FAULT ISOLATION

1. Referenced Procedure

R 21-21-00 Air Conditioning System Fault Isolation

2. Fault Isolation/Identification

Because of electrical interconnection and functional interaction between subsystems, fault isolation/identification procedures covering the Air Cycle System are included as part of those for
R the Air Conditioning System (Ref. 21-21-00).

AIR CYCLE SYSTEM ADJUSTMENT AND TEST

1. General

By operating the Environmental Control System (ECS) packs at specified conditions, it is possible to identify deterioration of various components of the system.

The performance check is performed from the Flight Engineer/Second Officer (FE/SO) panel and the performance interrogation is presented in graph form.

System setup requires utilization of a high pressure, uncooled ground air source and a specific turbine bypass valve (TBV) position dependent on outside air temperature (OAT). This is done to assure pack delivery output above 32°F (0°C), thus allowing performance evaluation of the various components. It also deters the effect of TBV seal ring leakage in an effort to minimize test variables.

NOTE: This test is most effective when performed at higher outside air temperatures above 60°F (16°C).

2. Equipment and Materials

High pressure, uncooled ground air source (approx. 30 psig)

3. Referenced Procedures

21-00-00	Air Conditioning System - Maintenance Practices
21-21-01	Pack Flow Control Valves - Removal and Installation
21-51-01	Dual Heat Exchangers - Removal and Installation
21-51-07	Air Cycle Machines - Removal and Installation
21-51-10	Compressor Bypass Check Valves - Removal and Installation
21-62-16	Turbine Bypass Valves - Removal and Installation
24-00-00	Electrical Power System - Maintenance Practices
49-00-01	Auxiliary Power Unit (APU) - Adjustment and Test

R 4. Environmental Control System (ECS) Pack Performance Test

R A. Preliminary Procedure

R (1) Record outside air temperature (OAT) on line 1 of ECS
R Pack Performance Tabulation Sheet, Figure 501.

R (2) Record relative humidity on line 2 of Figure 501.

R (3) On pilots overhead circuit breaker panel CB1, zone 210,
R verify following circuit breakers are closed:

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL 1 (H3)

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL 2 (H4)

R ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL 3 (H5)

R FUSE - ISLN - VALVE (G16)

R CROSSBLEED - VALVES - L (G17)

R CROSSBLEED - VALVES - R (G18)

R (4) On (FE/SO) overhead circuit breaker panel CB2, zone
R 215, verify following circuit breakers are closed:

R IND LT - F/E PANEL - UPPER (J3)

R IND LT - F/E PANEL - LOWER (J4)

R (5) On FE/SO aft circuit breaker panel CB3, zone 215,
R verify following circuit breakers are closed:

R HOT AIR MANF - IND (W5)

R HOT AIR MANF - TEMP CONT (W6)

R HOT AIR MANF - ISLN - No. 2 (W7)

R HOT AIR MANF - ISLN - No. 3 (W8)

R ECS AIR TEMP IND (V1)

R PACK FLOW IND (V2)

R PACK 1 - AUTO/MAN - DC (V5)

R PACK 1 - AUTO/MAN - AC (V6)

R PACK 2 - AUTO/MAN - DC (V7)

R PACK 2 - AUTO/MAN - AC (V8)

R PACK 3 - AUTO/MAN - DC (V17)

R PACK 3 - AUTO/MAN - AC (V18)

R APU BLEED AIR VALVE (S18)

R BLEED AIR IND (R17)

R ECS IND LT (G12)

R B. Auxiliary Power Unit (APU) Load Compressor Output Check

R NOTE: Low bleed air pressures can cause poor performance of
R the ECS packs.

R (1) Start APU (Ref. 49-00-01).

R (2) Turn on full service electrical power (Ref. 24-00-00).

R CAUTION: DO NOT OPEN APU BLEED AIR SHUT OFF (S/O) VALVE
R WITH ENGINE BLEED AIR OR HIGH PRESSURE EXTERNAL
R AIR PRESENT IN AIRCRAFT PNEUMATIC SYSTEM.

R (3) On FE/SO APU CONTROL panel, zone 215, latch in BLEED
R AIR S/O switchlight and verify OPEN light is on.

R (4) On FE/SO ENGINE BLEED CONTROL panel:

R (a) Latch in aft fuselage ISLN VALVE switchlight and
R verify flowbar is on.

R (b) Latch in both CROSS BLEED isolation valve
R switchlights and verify both flowbars are on.

R (c) Latch in No. 1 PACK FLOW CONTROL switchlight and
R verify flowbar is on.

R (d) Release No. 2 and No. 3 PACK FLOW CONTROL
R switchlights and verify flowbars are off.

R (5) On FE/SO CABIN TEMP CONTROL panel, release three (3)
R AUTO/MNL switchlights and verify three (3) MNL lights
R are on.

R (6) Based on OAT recorded in line 1 of Figure 501,
R determine and record minimum acceptable APU bleed air
R pressure using Figure 502. Enter value on line 3 of
R Figure 501.

R CAUTION: DO NOT OPERATE APU IN MAX MODE ANY LONGER THAN
R NECESSARY TO PERFORM STEP (7).

R DO NOT OPERATE APU IN MAX MODE WITH APU UNLOADED.

R (7) On FE/SO APU CONTROL panel, select mode selector switch
R to MAX MODE.

R (8) On FE/SO ENGINE BLEED CONTROL panel, record APU bleed
R air pressure from No. 2 bleed air pressure indicator.
R Enter reading on line 4 of Figure 501.

R (9) On FE/SO APU CONTROL panel, select mode selector switch
R to either NORM or MIN. MODE.

R (10) Release APU BLEED AIR S/O switchlight and verify OPEN
R light is off.

R (11) Compare minimum acceptable APU bleed air pressure
R recorded in line 3 of Figure 501 with actual MAX MODE
R bleed air pressure recorded in line 4 of Figure 501 to
R determine performance of APU load compressor.

R NOTE: Actual pressure should be greater than minimum
R acceptable pressure.

R C. Heat Exchanger and Air Cycle Machine (ACM) Nozzle Status

R (1) Connect uncooled, high pressure external air source
R (approximately 30 psig) (Ref. 21-00-00 Table 204).

R (2) On FE/SO ENGINE BLEED CONTROL panel, read external air
R source test pressure from No. 1, 2 or 3 bleed air
R pressure indicator and record test pressure on line 5
R of Figure 501.

R (3) Determine proper positioning of turbine bypass valve
R for each ECS PACK, using Figure 503 and outside air
R temperature (OAT) recorded in line 1 of Figure 501.
R Enter degrees of valve opening on line 6 of Figure 501.

R NOTE: Marks on TURB BYP position indicators are
R numbered clockwise (1 mark equals 5° of valve
R opening with full deflection clockwise equal to
R 90° of valve opening).

R (4) Position all three (3) turbine bypass valves to obtain
R appropriate mark on TURB BYP position indicator by
R manipulation of COOL and WARM buttons on FE/SO CABIN
R TEMP CONTROL panel.

R NOTE: Pressing cool button will open ram air exhaust valve (RAEV) fully before turbine bypass valve (TBV) begins to close. Pressing WARM button will open TBV and then close RAEV. Pressing both buttons simultaneously has no effect on either valve.

R (5) On FE/SO ENGINE BLEED CONTROL panel:

R (a) Release two PACK FLOW CONTROL switchlights and verify flowbars are off.

R (b) Verify PACK FLOW CONTROL switchlight for pack under test is latched in and flowbar is on.

R (6) On FE/SO ECS MONITOR panel:

R (a) Set PACK SELECT switch to pack under test.

R (b) Set ECS TEMP SELECT switch to TURB INLET.

R (c) Record indicated turbine inlet temperature from ECS TEMP indicator. Enter reading on line 7 of Figure 501.

R (d) Set ECS TEMP SELECT switch to ACM DISCH.

R (e) Record indicated air cycle machine (ACM) discharge temperature from ECS TEMP indicator. Enter reading on line 11 of Figure 501.

R (f) Record pack flow from PACK FLOW indicator. Enter reading on line 15 of Figure 501.

R (7) Repeat Steps 4C(5) and (6) for other packs.

R (8) Based on outside air temperature (OAT) (recorded on line 1 of Figure 501), select appropriate performance chart from Table 501 and record on line 16 of Figure 501.

R Performance Chart Selection
Table 501

OUTSIDE AIR TEMPERATURE	USE FIGURE
60 - 73°F (16 - 23°C)	506
74 - 89°F (24 - 32°C)	507

R Performance Chart Selection (Cont)
R Table 501

OUTSIDE AIR TEMPERATURE	USE FIGURE
90 - 115°F (33 - 46°C)	508

R (9) Modify temperature values recorded on lines 7 and 11 of Figure 501 for use with performance chart selected in Step 4C(8) by performing following steps:

R NOTE: If OAT recorded on line 1 of Figure 501 is below 80°F (27°C), no correction is necessary.

R (a) Using Figure 504 (Sheet 1), determine OAT correction factor for turbine inlet temperature and enter correction factor on line 8 of Figure 501.

R (b) Using Figure 504 (Sheet 2), determine correction factor for ACM discharge temperature and enter correction factor on line 12 of Figure 501.

R NOTE: Performance charts are based on 45% relative humidity or higher. If relative humidity is less than 45%, a temperature correction factor will be necessary.

R (c) Using Figure 505, determine humidity correction factor for turbine inlet temperature and enter correction factor on line 9 of Figure 501.

R (d) Using Figure 505, determine humidity correction factor for ACM discharge temperature and enter correction factor on line 13 of Figure 501.

R (e) On Figure 501, add lines 7, 8 and 9 to get corrected turbine inlet temperature and record on line 10.

R (f) On Figure 501, add lines 11, 12 and 13 to get corrected ACM discharge temperature and record on line 14.

R (10) Enter modified temperature values (Fig. 501, lines 10 and 14) into chart selected (Fig. 501, line 16) and determine performance of heat exchangers and ACM nozzles for each pack.

(11) Record performance (acceptable/unacceptable) on Figure 501.

D. Flow Control Check

(1) Latch in one PACK FLOW CONTROL switchlight and verify flowbar is on.

(2) Release other two PACK FLOW CONTROL switchlights and verify flowbars are off.

(3) Set PACK SELECT switch to pack under test.

(4) While monitoring PACK FLOW indicator on FE/SO ECS MONITOR panel, use respective COOL and WARM buttons on FE/SO CABIN TEMP CONTROL panel to position turbine bypass valve toward open (clockwise pointer deflection on TURB BYP position indicator) until pack flow no longer increases.

(5) Record pack flow on line 17 of Figure 501.

(6) Repeat Steps 4D(1) through (5) for other packs.

NOTE: If cubic feet per minute (cfm) does not lie between 2000 and 2500, then respective flow control valve is suspect (Ref. 21-21-01).

E. Heat Exchanger Bleed Side Blockage Check

(1) From readings tabulated in Figure 501, determine if heat exchanger bleed side is blocked. A combination of all the following indications together mean bleed side is probably blocked on that pack heat exchanger:

(a) Corrected turbine inlet temperature (line 10) lower than performance chart.

(b) Corrected ACM discharge temperature (line 14) acceptable.

(c) Flow control (line 17) acceptable.

(d) Pack flow (line 15) lower than other packs.

(2) If it is determined that any pack heat exchanger is blocked, replace respective pack heat exchanger (Ref. 21-51-01).

R F. HEAT EXCHANGER BLEED SIDE LEAKAGE CHECK

R NOTE: This test operates the system with the bleed side
R pressurized, without fan airflow, thus any flow and
R louver noise detected would be leakage related.

R (1) Disconnect and cap water aspirator supply line either
R at heat exchanger or water separator.

R (2) On FE/SO ECS MONITOR PANEL, verify ECS temp select
R switch is set to ACM DISCHARGE.

R (3) While monitoring ECS temperature indicator on FE/SO ECS
R MONITOR PANEL, use cool and warm buttons on FE/SO CABIN
R TEMPERATURE CONTROL PANEL to select respective turbine
R bypass valve toward hot (clockwise pointer deflection
R on turbine bypass position indicator). This will
R provide full turbine bypass with minimum fan operation.

R (4) Verify that no bleed air leakage from heat exchanger is
R audible (shrill hissing sound) through the RAM AIR
R EXHAUST VALVE LOUVERS for the pack under test.

R (5) If leakage is detected from any pack heat exchanger,
R replace the respective pack heat exchanger (Ref.
R 21-51-01).

R G. Turbine Bypass Valve Seal Ring Leakage Check

NOTE: The following test assumes any defective heat exchanger and/or air cycle machine has already been replaced.

(1) On FE/SO CABIN TEMP CONTROL panel, use COOL and WARM buttons to select turbine bypass valve full cold (counterclockwise deflection on TURB BYP indicator) and ram air exhaust valve full cold (counterclockwise deflection on RAM AIR indicator).

(2) Release two PACK FLOW CONTROL switchlights and verify flowbars are off.

(3) Verify PACK FLOW CONTROL switchlight for pack under test, is latched in and flowbar is on.

(4) On FE/SO ECS MONITOR panel:

(a) Set PACK SELECT switch to pack under test.

(b) Set ECS TEMP SELECT switch to ACM DISCH.

(5) Record ACM discharge temperature on line 18 of Figure 501.

R (6) Repeat Steps 4G(3) through (6) for other packs.

(7) If ACM discharge temperature of any pack is above 4°C, replace respective turbine bypass valve (Ref. 21-62-16).

R H. Compressor Bypass Check Valve Check

(1) If ACM discharge temperature recorded on line 18 of Figure 501 for respective pack is acceptable on performance chart, but turbine inlet temperature recorded on line 7 of Figure 501 is high on performance chart, replace compressor bypass check valve (Ref. 21-51-10).

AIRCRAFT NO. _____

PRELIMINARY

1	OUTSIDE AIR TEMPERATURE (OAT)	_____ (°C / °F)
2	RELATIVE HUMIDITY	_____ %

APU LOAD COMPRESSOR OUTPUT

3	MINIMUM ACCEPTABLE APU BLEED AIR PRESSURE (FIG. 502)	_____ PSIG
4	ACTUAL MAX MODE APU BLEED AIR PRESSURE	_____ PSIG

STATUS (CHECK ONE) ☐ ACCEPTABLE (PSIG LINE 3 ≤ PSIG LINE 4)
☐ LOW PRESSURE (PSIG LINE 4 < PSIG LINE 3)

HEAT EXCHANGER AND AIR CYCLE MACHINE (ACM) NOZZLE PERFORMANCE

		PACK 1	PACK 2	PACK 3
5	EXTERNAL HP AIR SOURCE TEST PRESSURE	_____ PSIG		
6	TURBINE BYPASS VALVE POSITION (FIG. 503)	_____ °OPEN	_____ °OPEN	_____ °OPEN
7	TURBINE INLET TEMP	_____ °C	_____ °C	_____ °C
8	OAT CORRECTION FACTOR (FIG. 504, SHT 1)	_____ °C	_____ °C	_____ °C
9	TURB INLET HUMIDITY CORRECTION FACTOR (FIG. 505)	_____ °C	_____ °C	_____ °C
10	CORRECTED TURBINE INLET TEMP (LINES 7, 8 & 9)	_____ °C	_____ °C	_____ °C
11	ACM DISCHARGE TEMP	_____ °C	_____ °C	_____ °C
12	OAT CORRECTION FACTOR (FIG. 504, SHT 2)	_____ °C	_____ °C	_____ °C
13	ACM DISCH HUMIDITY CORRECTION FACTOR (FIG. 505)	_____ °C	_____ °C	_____ °C
14	CORRECTED ACM DISCHARGE TEMP (LINES 11, 12 AND 13)	_____ °C	_____ °C	_____ °C
15	PACK FLOW	_____ CFM	_____ CFM	_____ CFM

16 PERFORMANCE CHART USED (CHECK ONE) ☐ FIGURE 506 ☐ FIGURE 507 ☐ FIGURE 508

HEAT EXCHANGER (21-51-03)

PERFORMANCE (CHECK ONE)		
PACK 1	☐ ACCEPTABLE	☐ UNACCEPTABLE
PACK 2	☐ ACCEPTABLE	☐ UNACCEPTABLE
PACK 3	☐ ACCEPTABLE	☐ UNACCEPTABLE

AIR CYCLE MACHINE (21-51-07)

PERFORMANCE (CHECK ONE)		
PACK 1	☐ ACCEPTABLE	☐ UNACCEPTABLE
PACK 2	☐ ACCEPTABLE	☐ UNACCEPTABLE
PACK 3	☐ ACCEPTABLE	☐ UNACCEPTABLE

PACK FLOW CHECK

		PACK 1	PACK 2	PACK 3
17	PACK FLOW	_____ CFM	_____ CFM	_____ CFM

TRUBINE BYPASS VALVE SEAL RING LEAKAGE CHECK

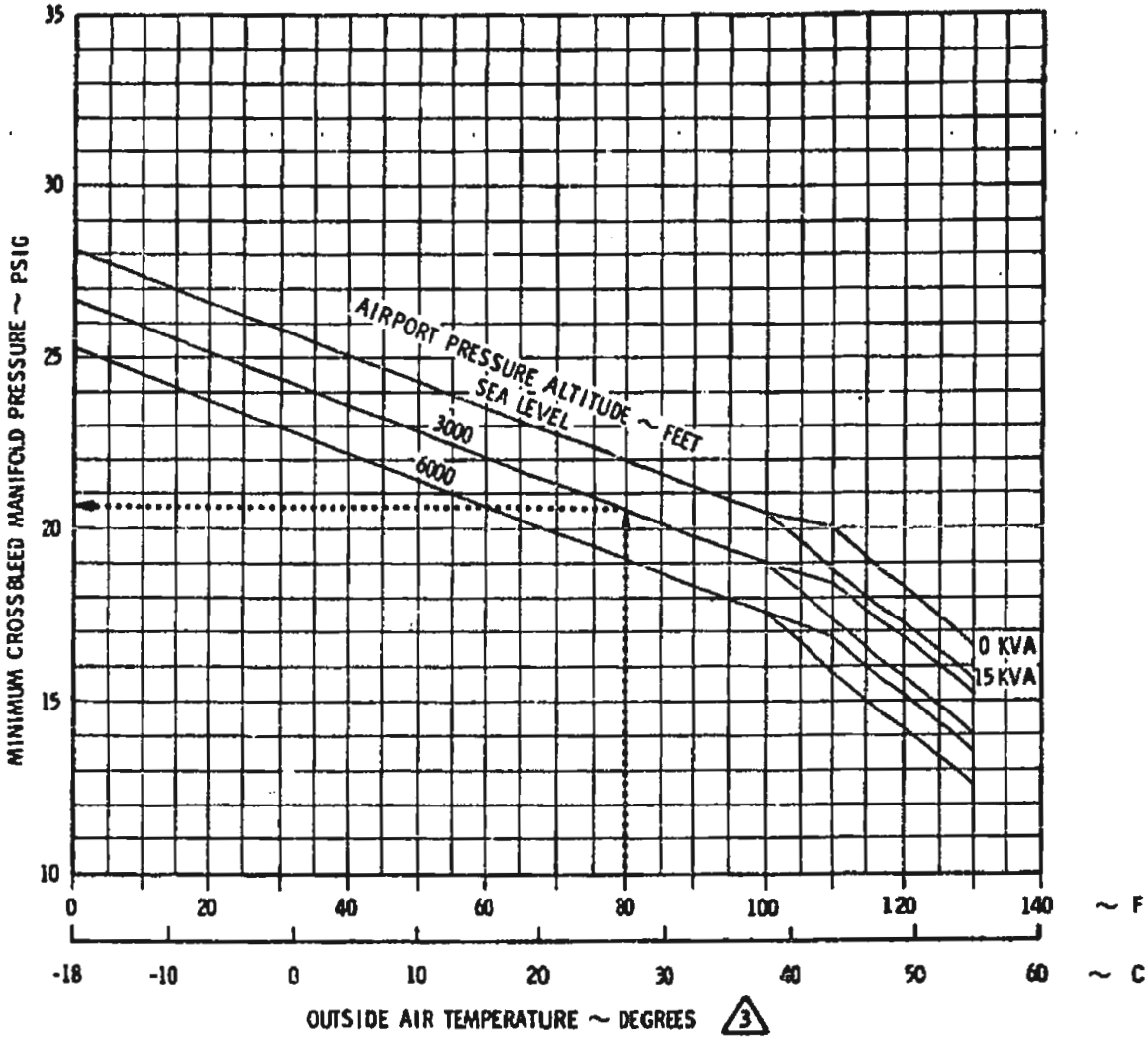
		PACK 1	PACK 2	PACK 3
18	ACM DISCHARGE TEMP	_____ °C	_____ °C	_____ °C

M1-0002-21-1422

R ECS Pack Performance
R Tabulation Sheet
R Figure 501

EFFECTIVITY: ALL

001B



NOTE

1 OPERATE ONE ECS PACK

2 CHECK CROSSBLEED MANIFOLD PRESSURE WITH APU IN MAX MODE

(3) FROM FIGURE 501, LINE 1

M1-0000-21-1423

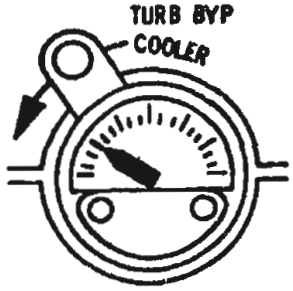
APU Load Compressor
Minimum Output Chart
Figure 502

NOTE

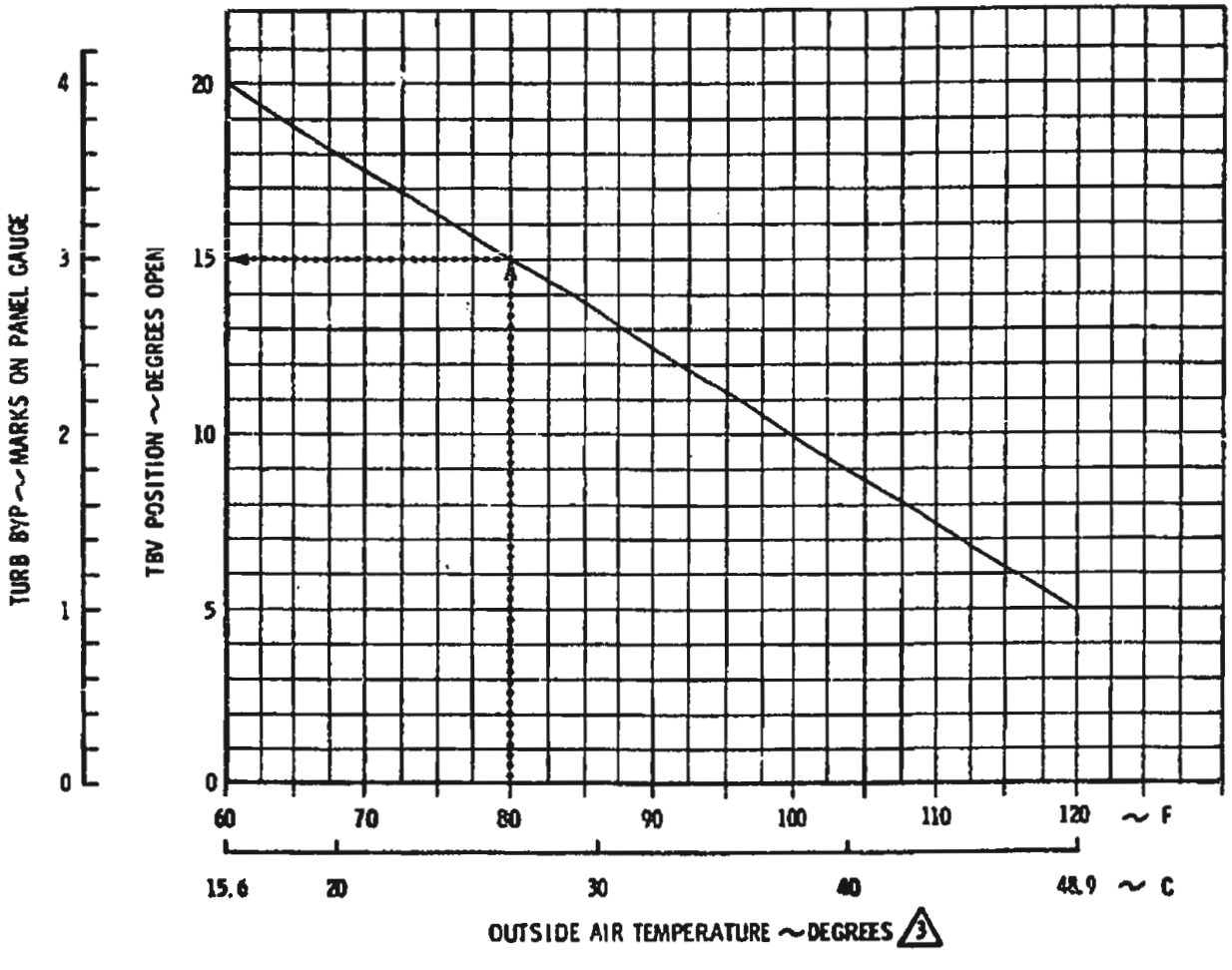
1 SELECT PACK MANUAL MODE

2 POSITION TURBINE BYPASS VALVE (TBV)

3 FROM FIGURE 501, LINE 1

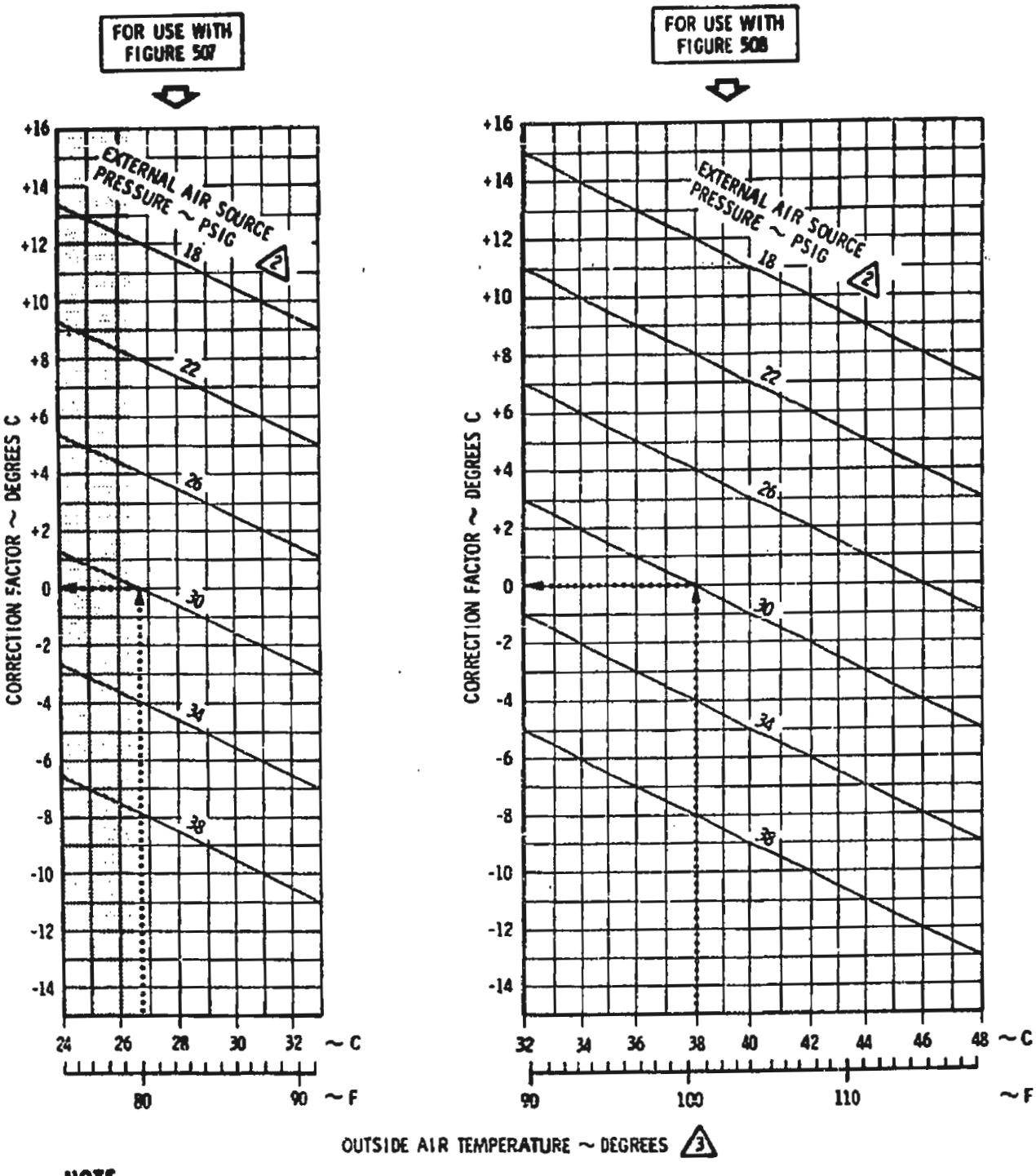


POSITION INDICATOR
(SHOWN 15° OPEN)



M1-0000-21-1424

Turbine Bypass Valve Position Chart
Figure 503



NOTE

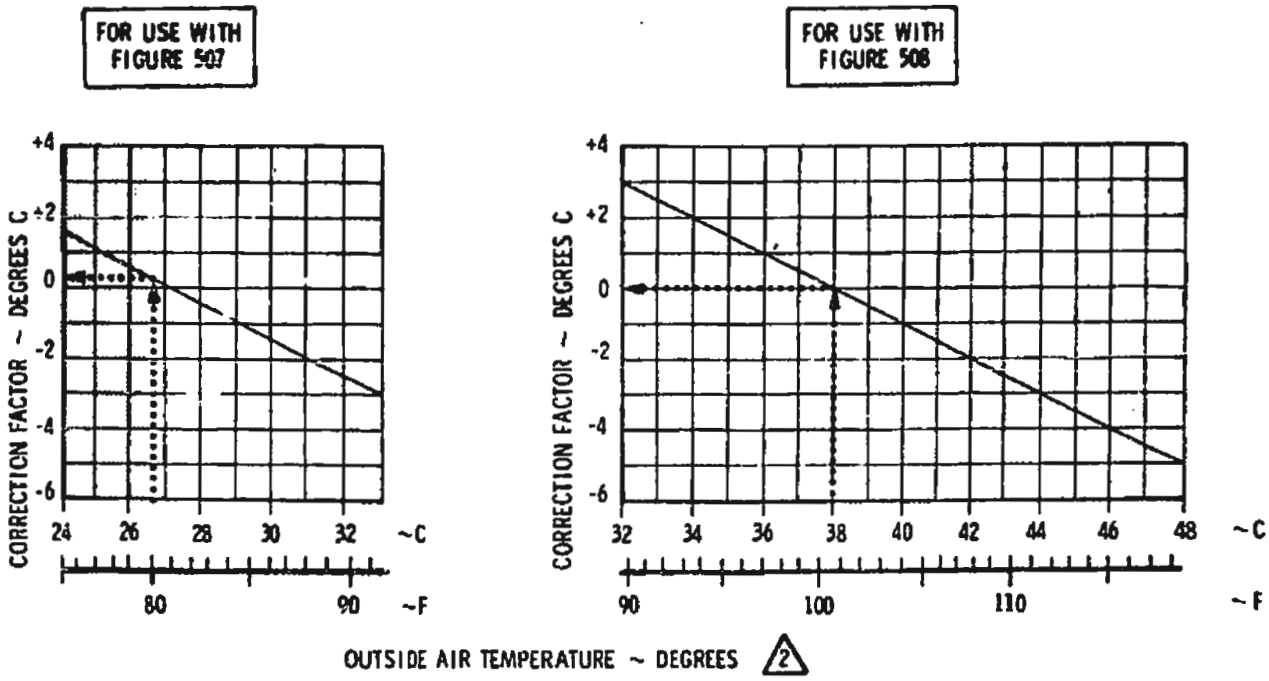
1 IF OAT IS LESS THAN 80°F (27°C), NO CORRECTION IS NECESSARY

2 FROM FIGURE 501, LINE 5

3 FROM FIGURE 508, LINE 1

M1-0000-21-1425

Outside Air Temperature Correction Factor
Turbine Inlet Temperature
Figure 504 (Sheet 1)



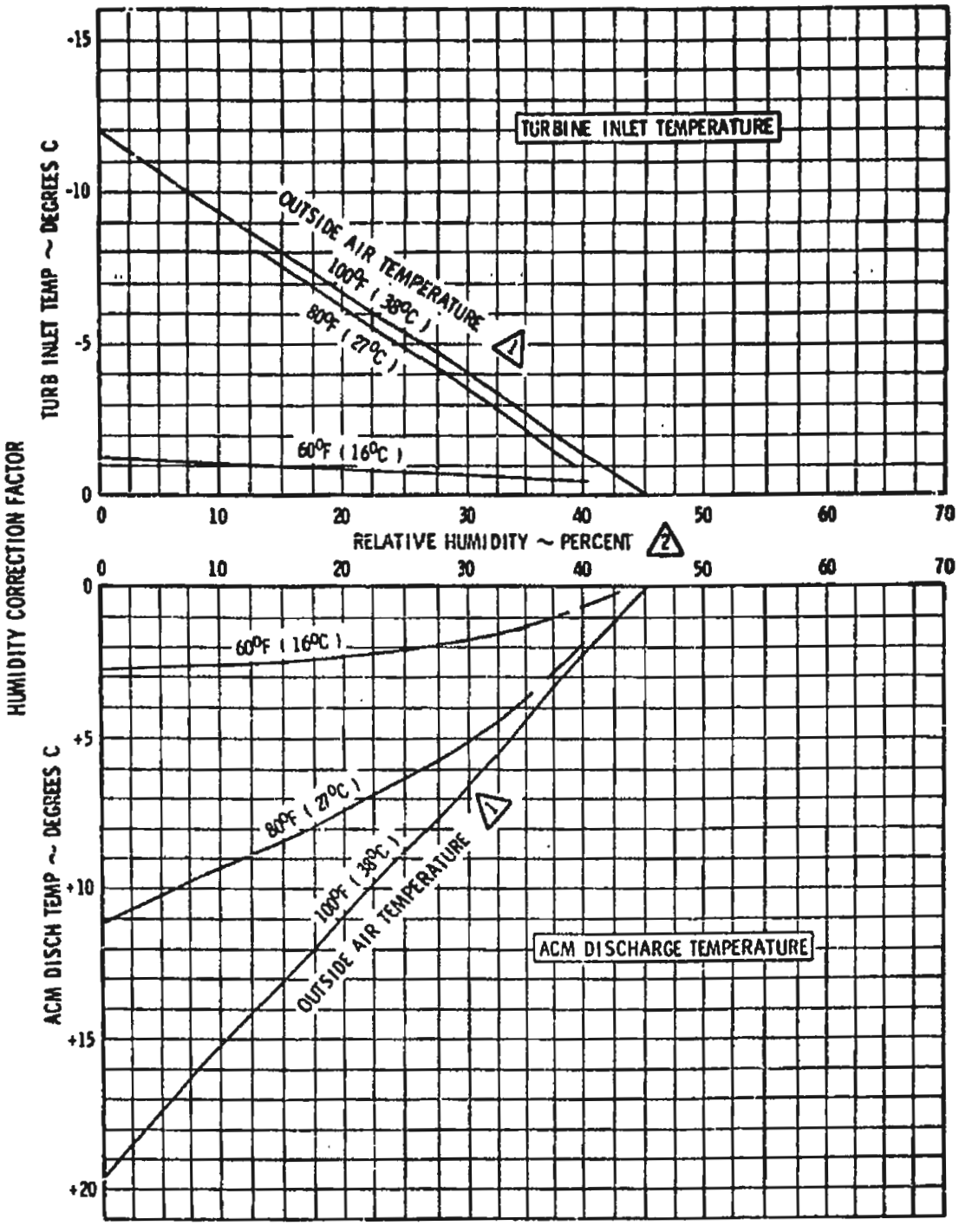
NOTE

1 IF OAT IS LESS THAN 80°F (27°C), NO CORRECTION IS NECESSARY

2 FROM FIGURE 501, LINE 1

M1-0000-21-1426

Outside Air Temperature Correction Factor
ACM Discharge Temperature
Figure 504 (Sheet 2)

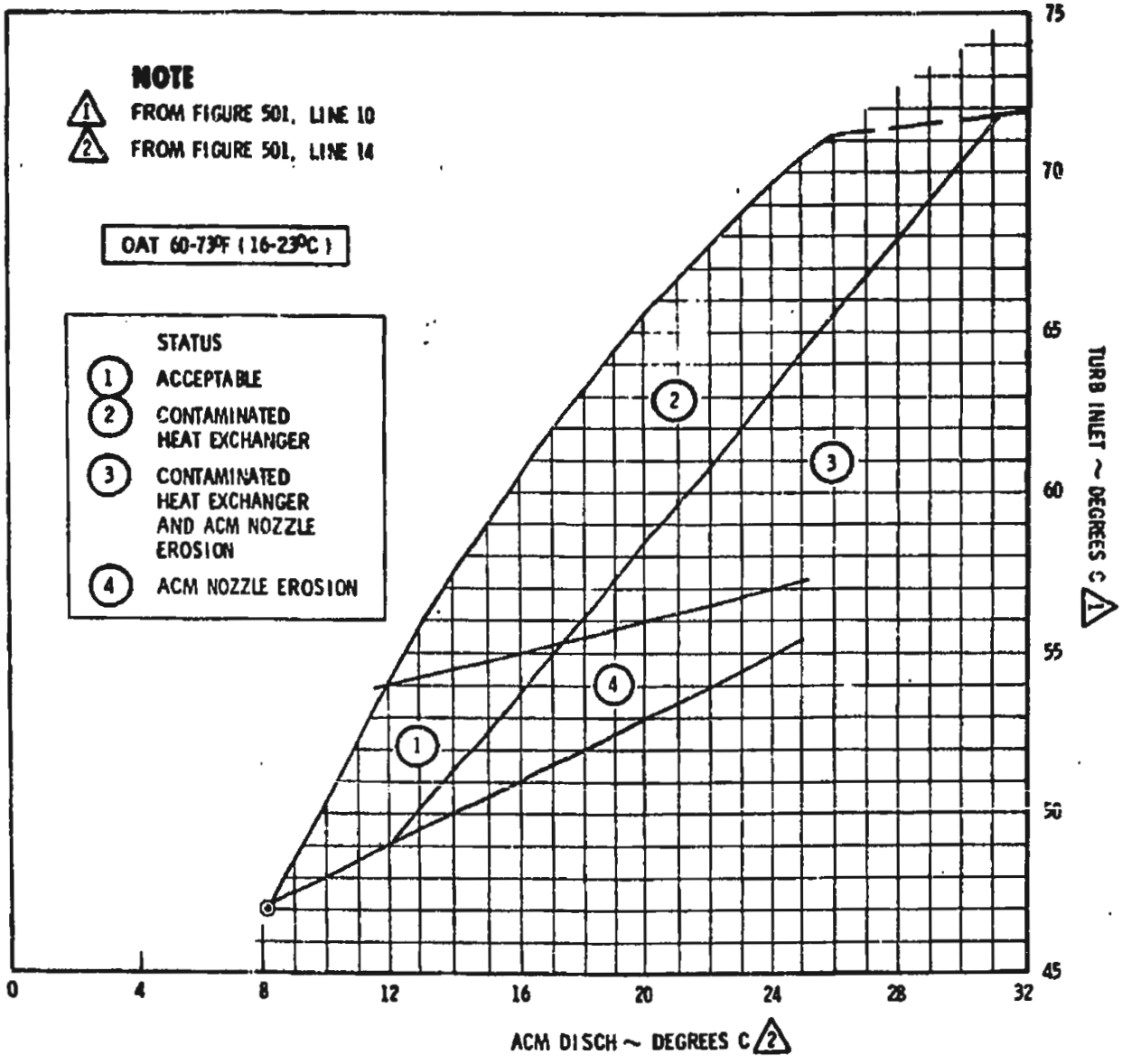


NOTE

1. FROM FIGURE 501, LINE 1
2. FROM FIGURE 501, LINE 2

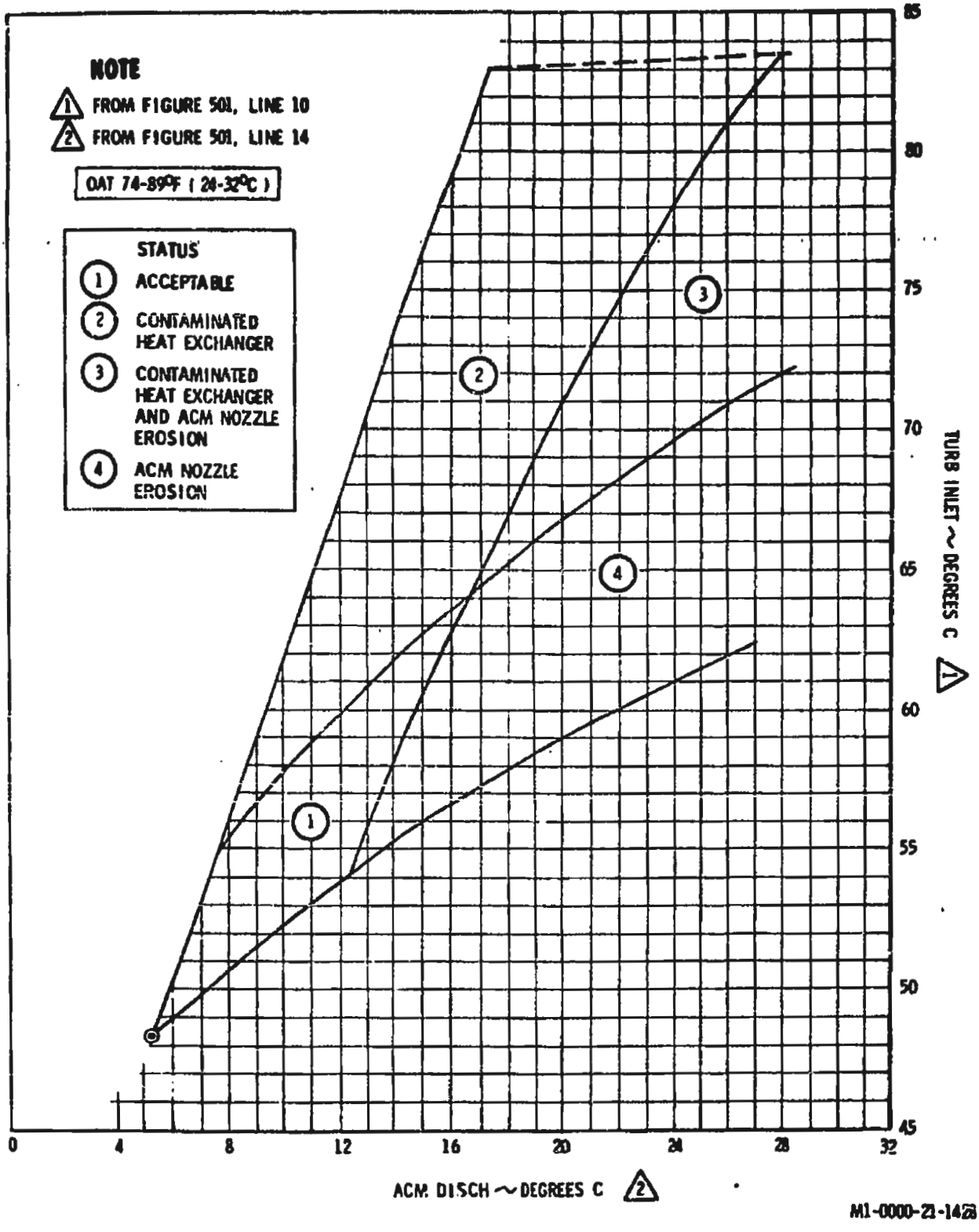
MI-0000-21-1924

Humidity Correction Factors
Figure 505

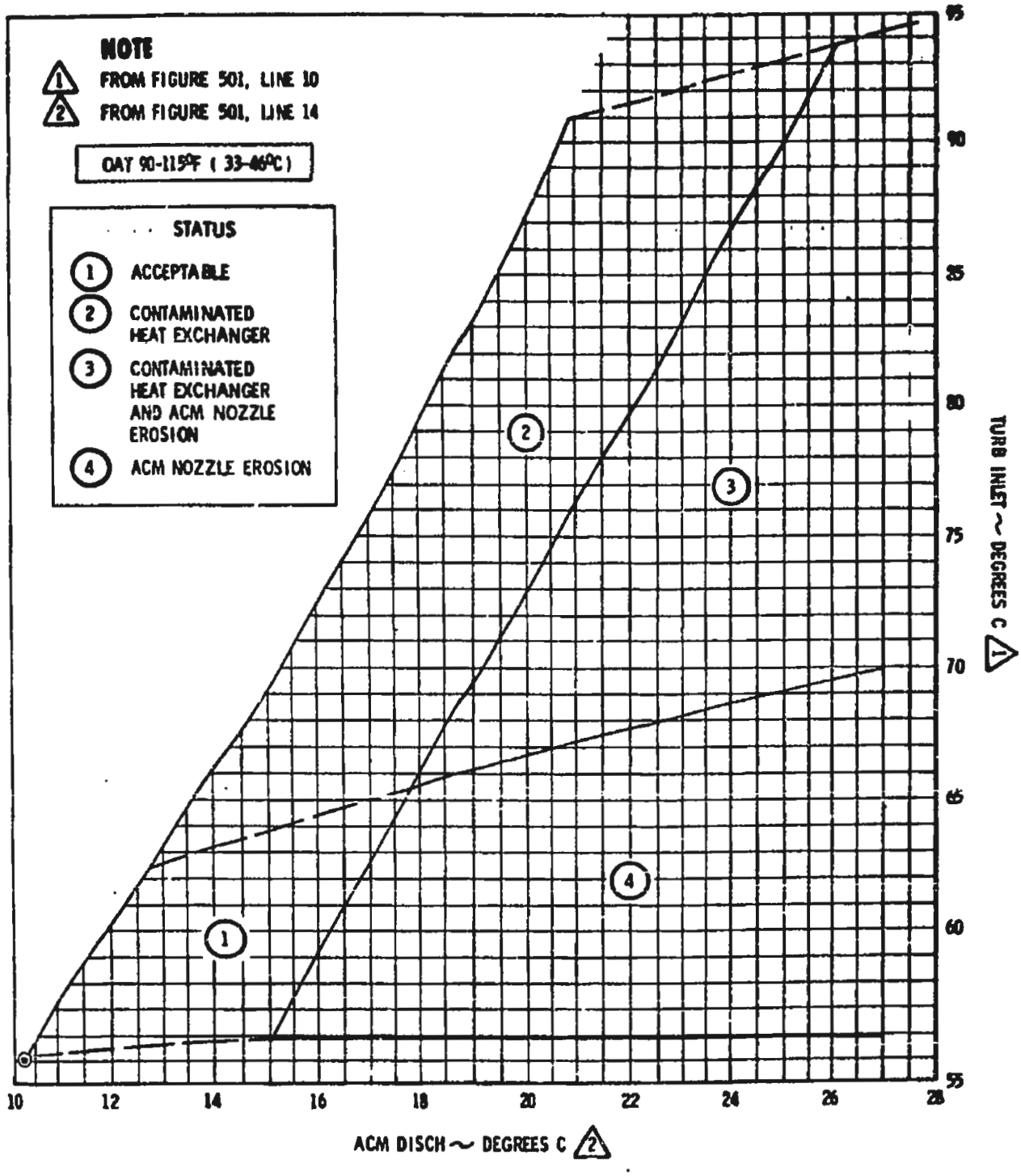


M1-0000-21-1427

Heat Exchanger and ACM Nozzle Performance Chart
Figure 506



Heat Exchanger and ACM Nozzle Performance Chart
Figure 507


NOTE
1 FROM FIGURE 501, LINE 10
2 FROM FIGURE 501, LINE 14
OAT 90-115°F (33-46°C)
STATUS
1 ACCEPTABLE
2 CONTAMINATED HEAT EXCHANGER
3 CONTAMINATED HEAT EXCHANGER AND ACM NOZZLE EROSION
4 ACM NOZZLE EROSION
10 12 14 16 18 20 22 24 26 28
ACM DISCH ~ DEGREES C 2
95 90 85 80 75 70 65 60 55
TURB INLET ~ DEGREES C 1

MI-0000-21-3429

Heat Exchanger and ACM Nozzle Performance Chart
Figure 508

R EFFECTIVITY: ALL
R
001B

DUAL HEAT EXCHANGER - MAINTENANCE PRACTICES

1. General

R Deactivation for an inoperative dual heat exchanger is
R accomplished by deactivation of the pack flow control valve for
R that air cycle system.

2. Referenced Procedure

21-21-01 Pack Flow Control Valve - Maintenance Practices

3. Maintenance Practices

A. Deactivation

(1) Deactivate pack flow control valve in same air cycle system as inoperative dual heat exchanger (Ref. 21-21-01).

(2) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard applicable air cycle pack control AUTO - MNL switchlight DUAL HEAT EXCHANGER INOPERATIVE.

(3) Make appropriate entry in aircraft log book.

DUAL HEAT EXCHANGER - REMOVAL AND INSTALLATION

1. General

In each of the three air cycle cooling systems the dual heat exchanger, the ram cooling header and check valve, and the ram air exhaust valve and actuator are removed and installed as an assembly.

The No. 1 system assembly (pack) is in the left heat exchanger compartment, zone 115. Access is through access panels 115AL and 115AL-1. Access to the left environmental control system (ECS) compartment, zone 117, is also required, and is through ECS compartment door 117AL.

The No. 2 and No. 3 system packs are in the right heat exchanger compartments, zone 116. Zone 116 is separated into two heat exchanger compartments by a longitudinal bulkhead, providing separate compartments for the No. 2 pack (lower compartment) and the No. 3 pack (upper compartment). Access to No. 2 pack is
R through access panels 116AR and 116AR-1 and to No. 3 pack
R through access panels 116BR and 116BR-1. Required access to the right ECS compartment, zone 118, is through ECS compartment door 118CR.

2. Equipment and Materials

Dolly, Heat Exchanger, BG88, or equivalent

Gasket, PN 1507069-101, or equivalent

O-rings (2), MS9068-434, or equivalent

O-ring Lubricant, MIL-G-4333 (DC55), or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

20-21-01	Flexible Swaged Couplings - Removal and Installation
20-36-01	Single T-bolt V-band Couplings - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
21-62-13	Ram Air Exhaust Valve - Adjustment and Test

4. Removal/Installation

WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES. RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

CAUTION: WHEN REMOVING AN ACM OR HEAT EXCHANGER BE SURE TO REMOVE THE QUICK DISCONNECT PIN AND SLIDE INLET SHELL FORWARD TO EXPOSE MACHINE SCREW. UNSCREW MACHINE SCREW AND SLIDE DIFFUSER FORWARD ON SUPPORT RODS IN RAM AIR HEADER.

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

A. Removal

(1) Actuate ram air exhaust valve to fully closed position (Ref. 21-62-13).

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the applicable following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5) and AC (V6)

PACK 2 - AUTO/MAN - DC (V7) and AC (V8)

PACK 3 - AUTO/MAN - DC (V17) and AC (V18)

(3) Remove heat exchanger compartment access panels 115AL and 115AL-1 (No. 1), 116AR and 116AR-1 (No. 2), or 116BR and 116BR-1 (No. 3) (Ref. Fig. 401).

(4) Open ECS compartment door 117AL (No. 1) or 118CR (No. 2 or No. 3).

(5) At bottom of air cycle machine (ACM), pull quick-disconnect pin connecting fan inlet shell to ACM and telescope fan inlet shell forward for access to fan diffuser housing inside shell.

(6) Loosen machine screw connecting fan diffuser housing to ACM dome housing at aft bottom portion of diffuser.

(7) Gently slide diffuser housing forward on support rods in ram air header, completely into header.

CR (8) Deleted.

(9) Disconnect electrical cable connectors from ram air exhaust valve actuator, install protective caps on actuator and cable connectors, and stow cables clear of opening.

(10) Disconnect three single T-bolt V-band couplings on ducts at aft end of heat exchanger, sliding couplings aft onto ducts (Ref. 20-36-01).

(11) Disconnect flexible coupling on fourth duct, remove and discard O-rings, retain all other parts of coupling (Ref. 20-21-01).

CAUTION: EXCESSIVE SIDE LOADS ON RAM AIR EXHAUST VALVE FRAME MOUNTING LUGS CAN RESULT IN FAILURE OF THE LUGS.

(12) Position transmission jack, with heat exchanger dolly attached, under ram air exhaust valve frame, operate jack and heat exchanger dolly to accurately position dolly at center of frame and secure exhaust frame to heat exchanger dolly (Ref. Fig. 402).

(13) Operate transmission jack and heat exchanger dolly to support valve, heat exchanger, and header assembly (pack).

NOTE: Readjust jack and dolly as necessary to remove bind on pack support attachment bolts during removal of bolts.

(14) At forward end of exhaust valve, below valve actuating linkage torque tube, loosen single bolt connecting support link to exhaust valve frame, remove two bolts connecting link to support fitting, and rotate support link upward to clear support fitting. Tighten single bolt to hold support link in position.

(15) Remove bolt and spacers connecting valve frame directly to forward "T" support fitting.

(16) At aft end of exhaust valve, remove bolts connecting valve frame to aft support fitting.

(17) Operate transmission jack and heat exchanger dolly to extract pack from compartment. Operate slowly until pack is clear of compartment, adjusting jack and dolly as necessary to maintain clearance between pack components and structure.

(18) Verify all duct flanges on heat exchanger and in aircraft are undamaged and install protective caps on

all duct openings unless immediate installation of replacement pack is to be done.

(19) Attach handling adapter to exhaust valve frame (Ref. Fig. 402.

(20) Remove pack from heat exchanger dolly. (If handling adapter is not used, place pack only on clean flat padded surface, exhaust valve dowm).

CR (21) Deleted.

(22) Remove bolts connecting header to heat exchanger and remove header.

(23) Remove bolts connecting heat exchanger to exhaust valve and remove heat exchanger (approximately 114 pounds).

(24) Inspect gasket mounted between heat exchanger and exhaust valve. Retain gasket for installation if undamaged.

NOTE: If the left heat exchanger was removed, it is advisable to perform a functional test on waterline heater system H (Ref. 30-71-00, Adjustment/Test). H zone heater diodes and associated terminal blocks may be relocated from heat exchanger compartment TB53 to left ECS compartment TB52.

C
C
C
C

B. Installation

(1) Verify circuit breakers opened in Step 4A(2) are open and tagged.

(2) Inspect gasket to be installed between heat exchanger and exhaust valve. If damaged, replace with new gasket. Install gasket on exhaust valve.

(3) Install heat exchanger (approximately 114 pounds) on valve.

(4) Verify ACM fan diffuser housing is in header and install header on heat exchanger.

CR (5) Deleted.

(6) Install exhaust valve, heat exchanger, and header assembly (pack) on heat exchanger dolly on transmission jack and remove handling adapter.

(7) Inspect heat exchanger compartment for cleanliness and verify that:

CR (a) Deleted.

(b) Actuator cable and connectors are clean and undamaged and positioned to prevent damage during pack installation.

(c) Exhaust valve support fittings at forward and aft ends of compartment are clean and undamaged.

(8) Remove protective caps from ducts at aft end of compartment and on heat exchanger. Verify duct flanges and couplings are clean and undamaged. Replace any damaged couplings or components of couplings (Ref. 20-21-01 and 20-36-01). Place couplings on ducts ready for installation.

(9) Lubricate new o-rings and install fully into flexible coupling nut and body (Ref. 20-21-01) on heat exchanger and on duct in compartment. Remove any lubricant from exterior of nut or body.

CAUTION: EXCESSIVE SIDE LOADS ON RAM AIR EXHAUST VALVE FRAME MOUNTING LUGS CAN RESULT IN FAILURE OF THE LUGS.

(10) Operate transmission jack and heat exchanger dolly to insert pack into compartment. Adjust jack and dolly as necessary to maintain clearance of components.

(11) As pack nears final installation position, adjust jack and dolly as necessary to align attaching bolt holes in exhaust valve frame and support fittings on structure.

(12) Install bolts connecting aft end of exhaust valve frame to aft support fitting. Do not tighten bolts.

(13) At forward end of exhaust valve frame, install bolt and spacers connecting valve frame directly to forward "T" support fitting.

(14) Below valve actuating linkage torque tube, rotate support link down into position and install bolts connecting link to forward support fitting. Torque bolts connecting link to support fitting. Do not tighten bolt through support link and valve frame fitting.

(15) Operate transmission jack and heat exchanger dolly to remove load and disconnect dolly from exhaust valve frame.

(16) Remove transmission jack with heat exchanger dolly from work area.

(17) Connect flexible coupling connecting duct to heat exchanger at aft end (Ref. 20-21-01). If duct position inhibits alignment of coupling components, proceed as follows:

(a) In ECS compartment, remove single T-bolt V-band coupling connecting other end of duct to the turbine bypass valve.

(b) Loosen coupling on seal where duct passes through bulkhead between heat exchanger and ECS compartments.

(c) With man in ECS compartment to assist, move duct to obtain necessary alignment of flexible coupling components and connect coupling. Do not tighten coupling.

(d) Reconnect duct to turbine bypass valve and torque single T-bolt V-band coupling (Ref. 20-36-01).

(e) Tighten bulkhead seal coupling.

(18) Install and torque three single T-bolt V-band couplings connecting ducts to heat exchanger (Ref. 21-36-01).

NOTE: One man working in the ECS compartment can assist in aligning ducts with heat exchanger connections.

(19) Torque and lockwire flexible coupling on duct to heat exchanger connection (Ref. 20-21-01.

(20) Torque all exhaust valve frame to support fitting bolts.

(21) Remove protective caps and connect electrical cable connectors to ram air exhaust valve actuator.

CR (22) Deleted.

(23) In ECS compartment, pull diffuser housing aft from header to ACM dome housing.

(24) Rotate diffuser housing to align indexing arrows, and secure to ACM dome housing with machine screw at bottom. Torque screw 10 to 15 lb in.

(25) Pull inlet shell aft from telescoped position, rotate as necessary to align shell, and secure to ACM with quick disconnect pin at bottom.

WARNING: KEEP ALL PERSONNEL CLEAR OF RAM AIR EXHAUST VALVE.

(26) Remove tags installed at beginning of Step 4.

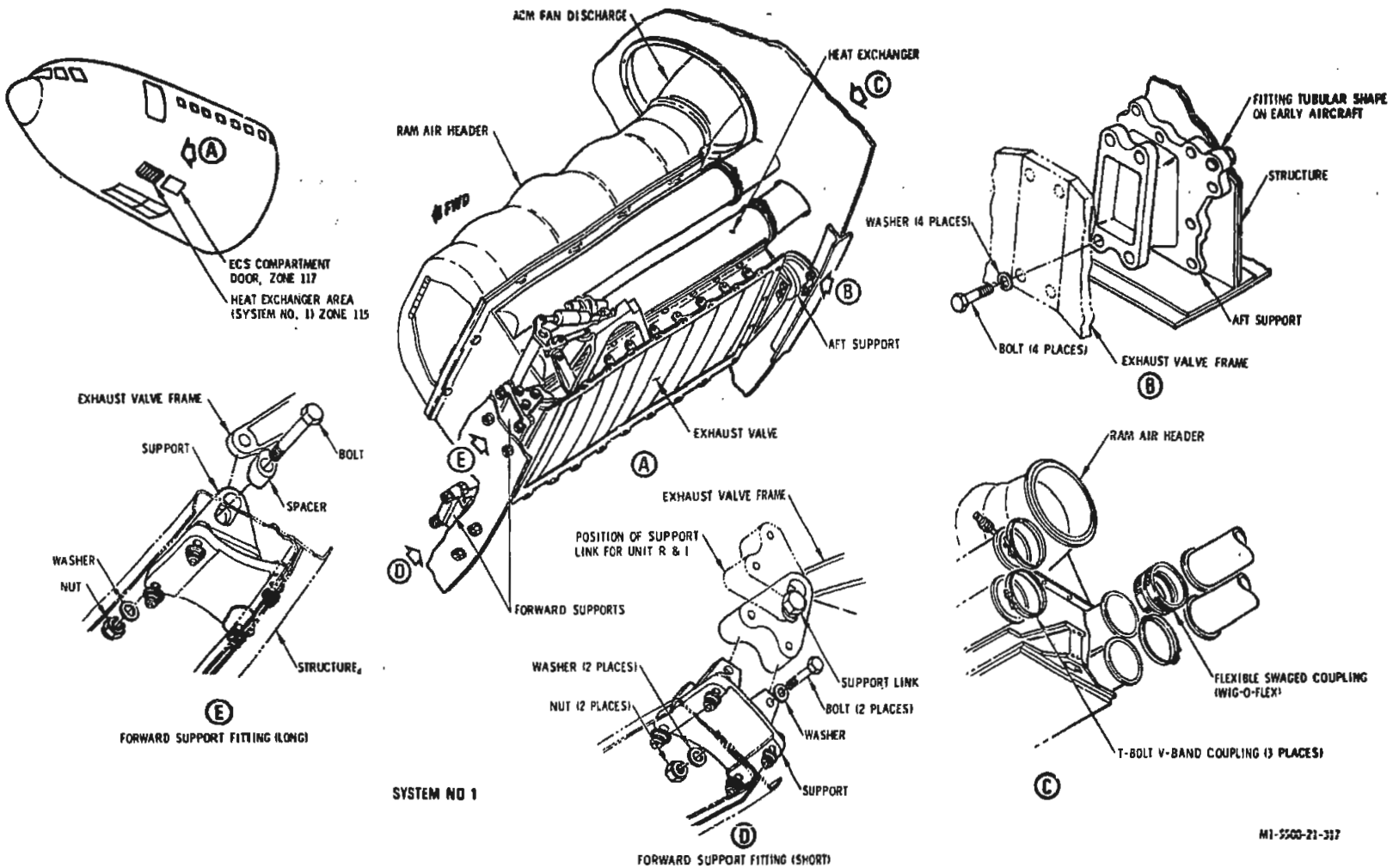
(27) Remove tags and close circuit breakers opened in Step 4A(2).

(28) Check operation of ram air exhaust valve (Ref. 21-62-13).

(29) Operate air cycle cooling system (Ref. 21-00-00), long enough to check for air leakage at duct connections and components in both compartments.

(30) Close ECS compartment access door.

(31) Install access panels removed in Step 4A(3).



CR Dual Heat Exchanger - Removal and Installation
CR Figure 401 (Sheet 1)

EFFECTIVITY: ALL

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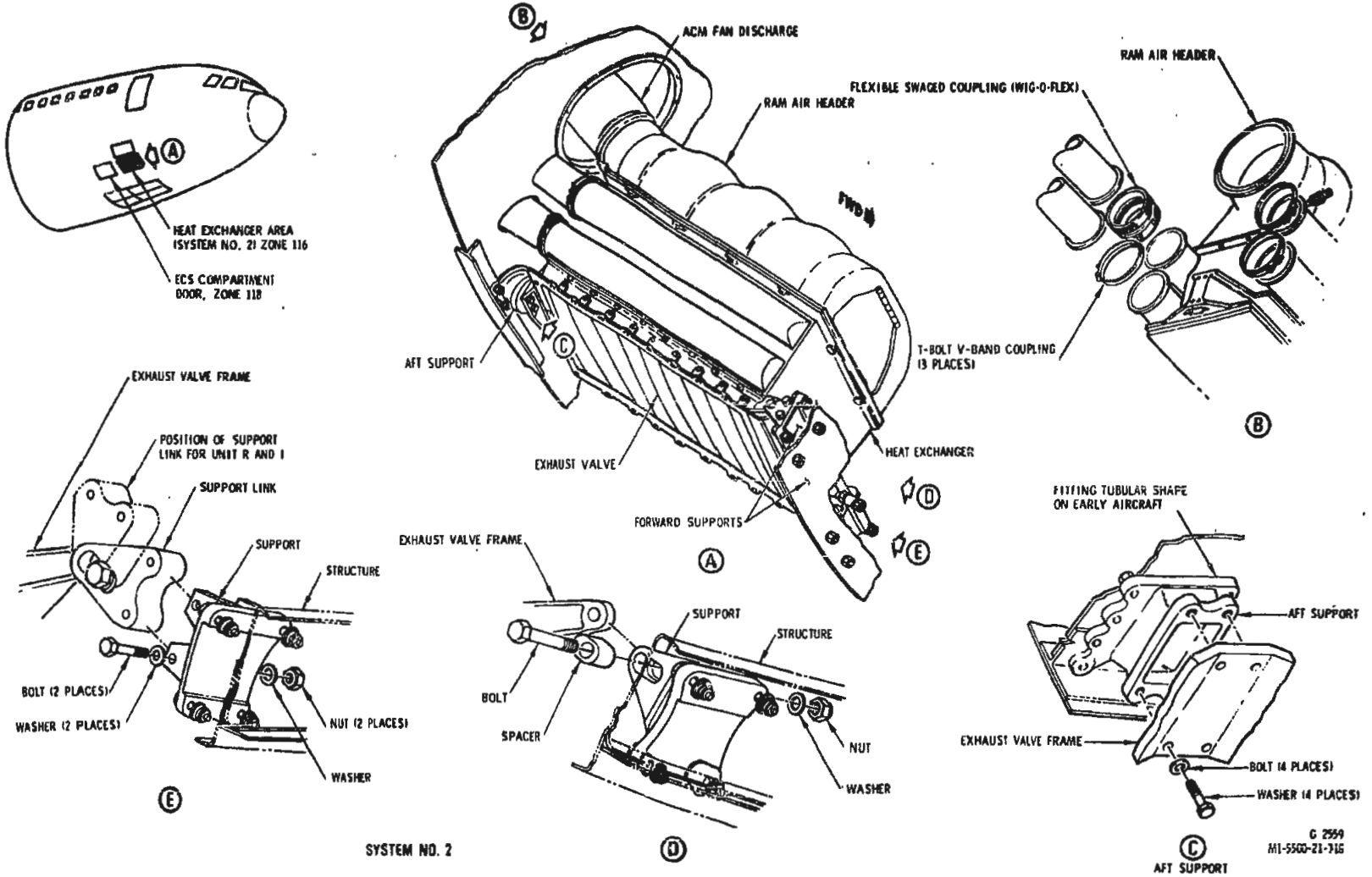
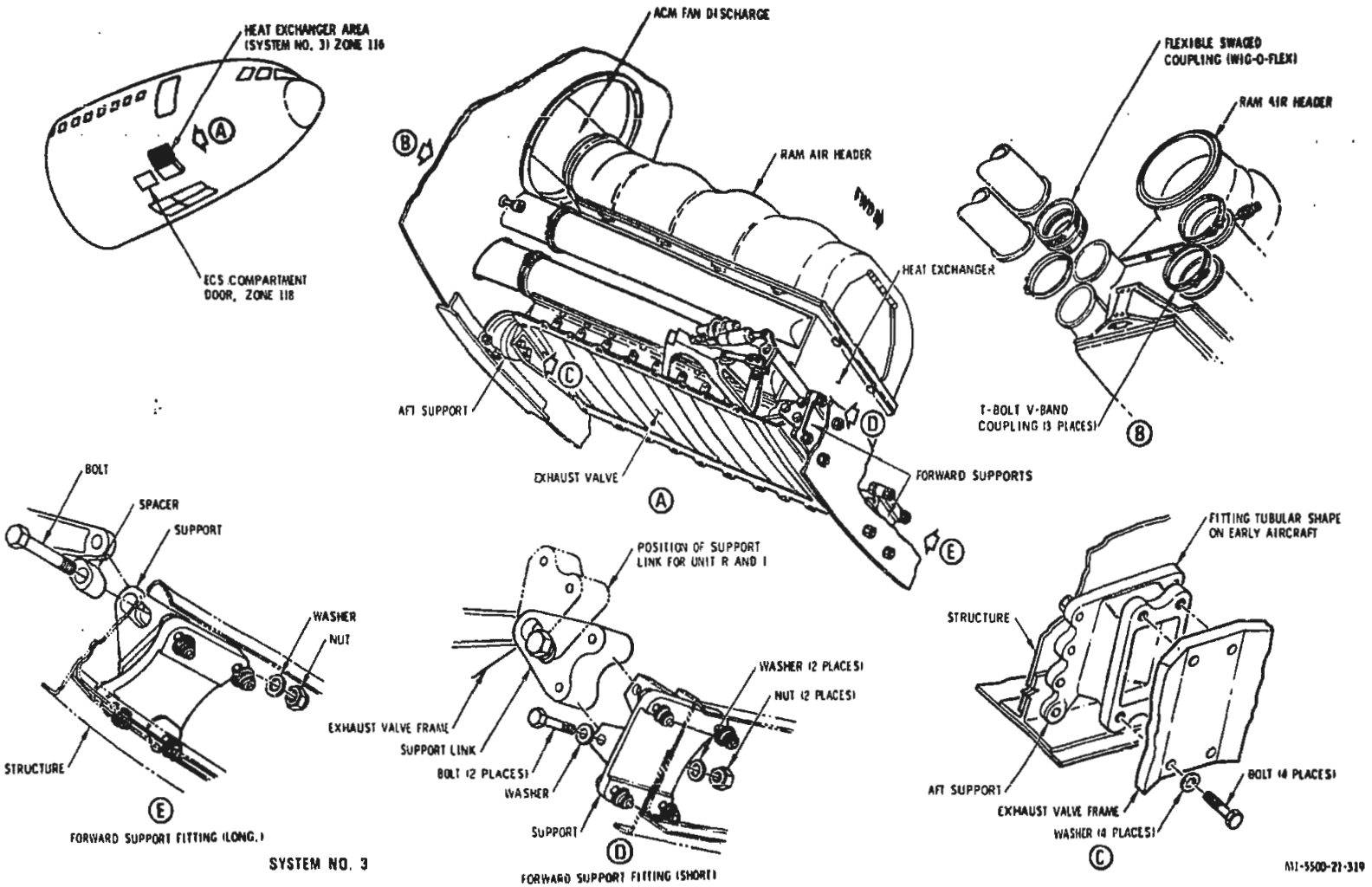


CR Dual Heat Exchangers - Removal and Installation
CR Figure 401 (Sheet 2)

EFFECTIVITY: ALL

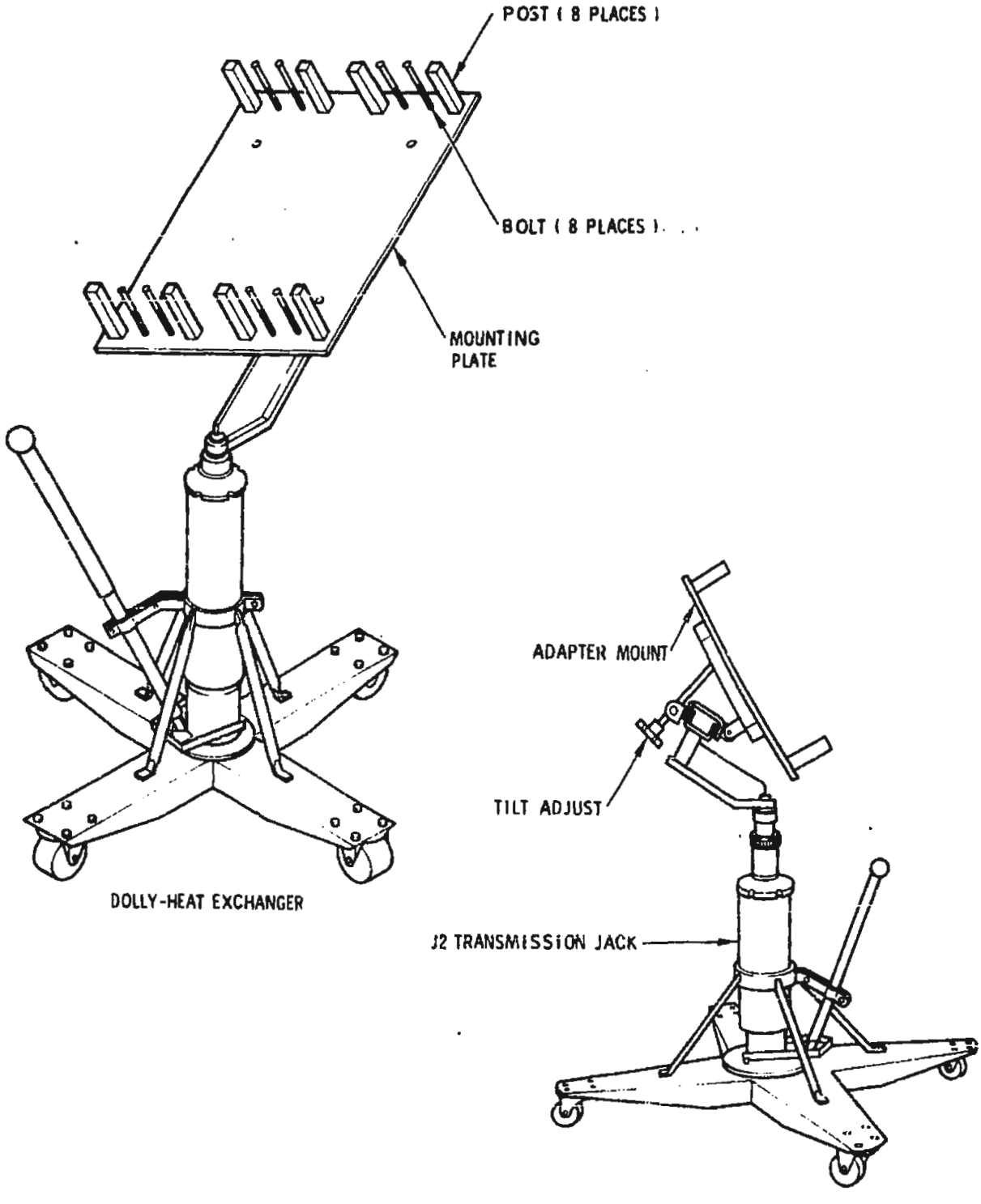
001B



CR Dual Heat Exchanger - Removal and Installation
CR Figure 401 (Sheet 3)

EFFECTIVITY: ALL

001B



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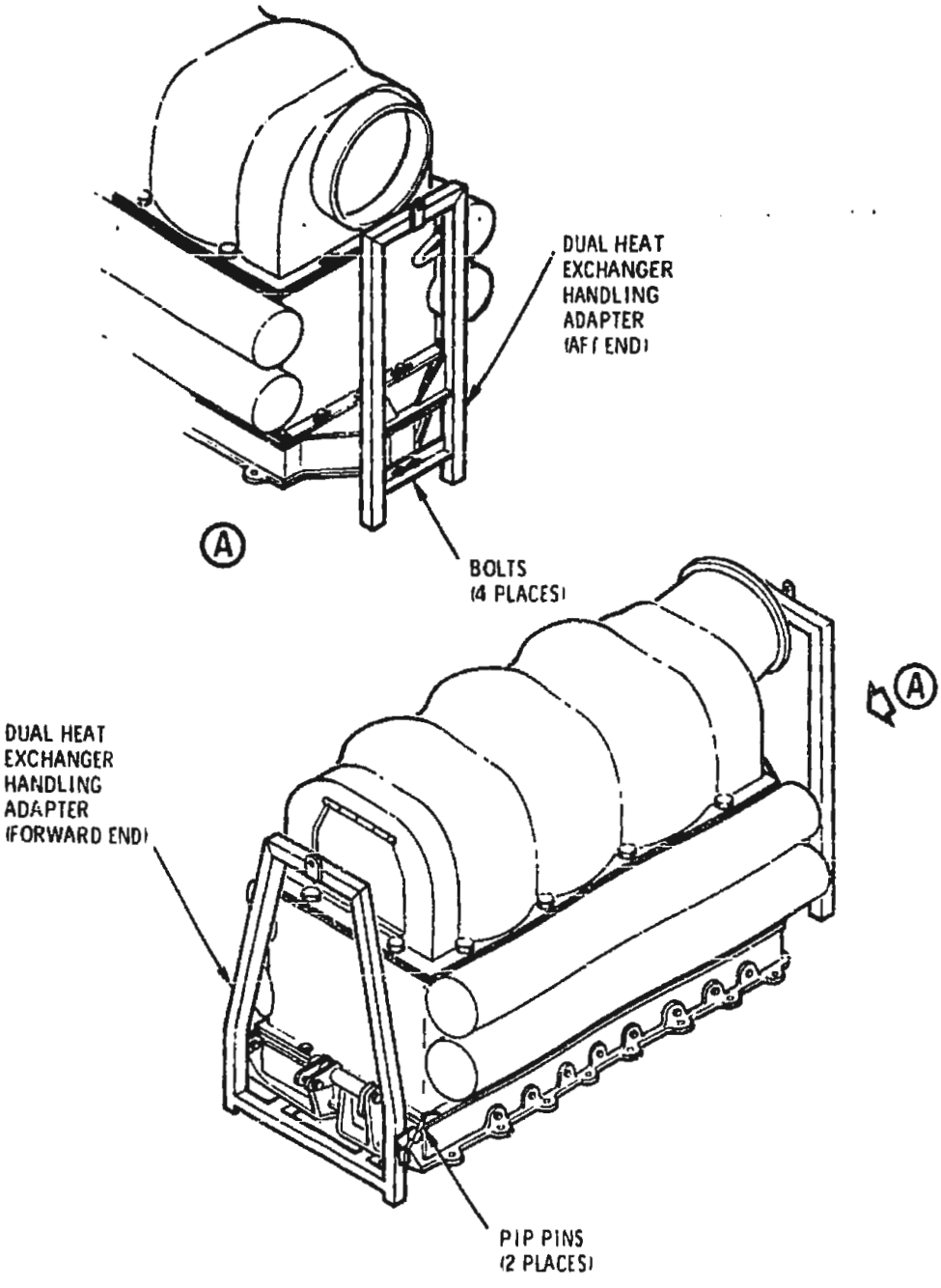
R Heat Exchanger Dolly and Transmission Jack
R Figure 402 (Sheet 1)



HH 8800
M1-0100-21-240

R Dual Heat Exchanger Rail Hoisting Assembly
R Figure 402 (Sheet 2)

R

DUAL HEAT EXCHANGER - INSPECTION AND CHECK

R 1. General

R The outer face of the dual heat exchanger may be checked through
R the open exhaust valve. The input and output ducts and outer
R shell may be checked by removing the access panels around the
R heat exchangers. The inboard face of the heat exchanger can be
R checked through the ram air cooling header check valve and an
R inspection access panel provided in the aft bulkhead of the
R forward electronic service center (Ref. Fig. 601). With the
R inspection access panel removed, the ram air header check valve
R may be manually opened and the inner face of the exchanger
R checked.

R 2. Equipment and Materials

R Dowel - 1/4 to 1/2 - inch diameter, approximately 2-feet long

R 3. Referenced Procedure

R 24-00-00 Electrical Power - Maintenance Practices

R 4. Inspection/Check

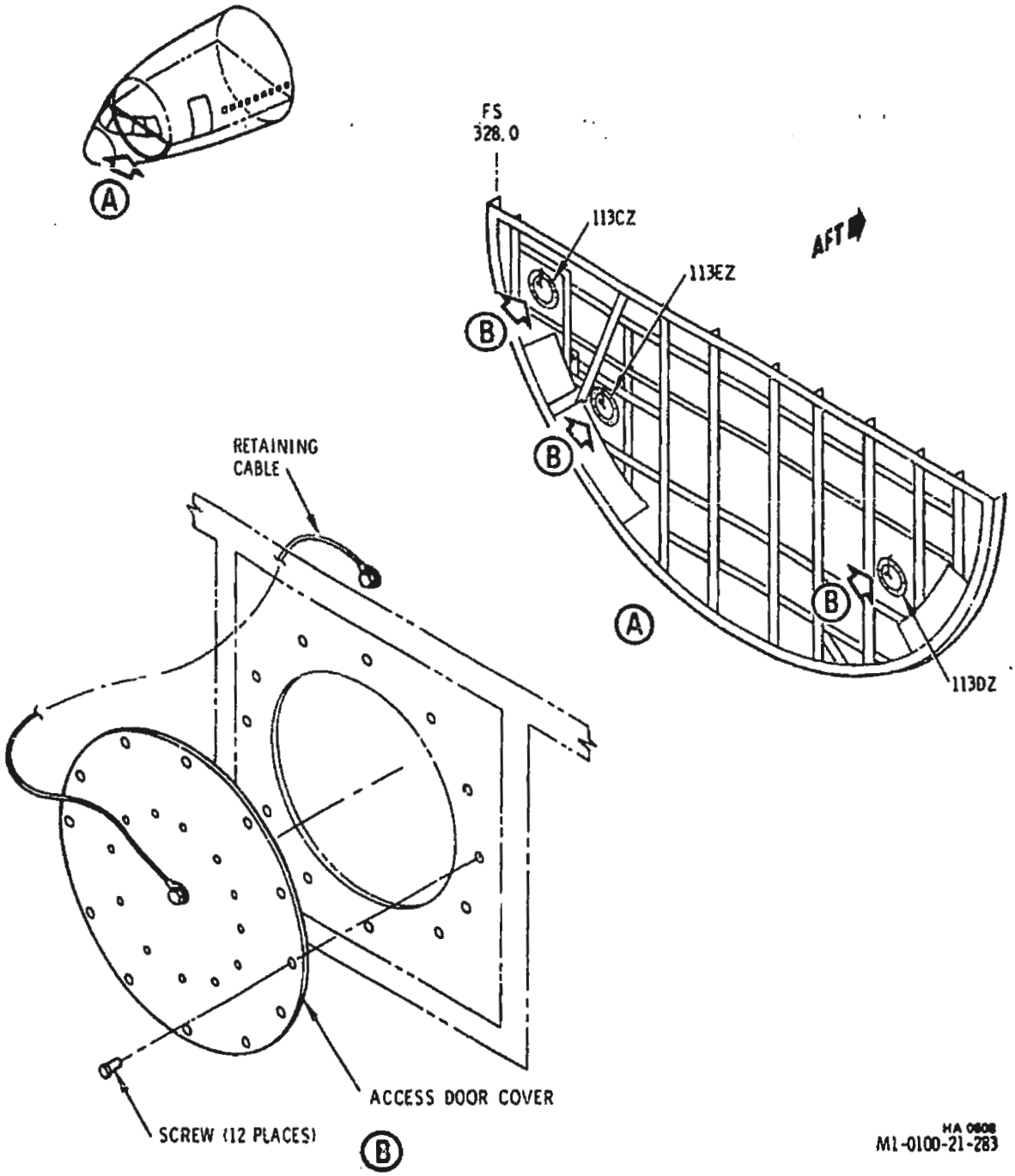
R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU
R CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR
R CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL
R COMPLETION OF PROCEDURES. RECENT OPERATION OF
R AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS
R AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE
R GLOVES SHOULD BE USED WHEN REQUIRED.

R A. Check

R (1) On Flight Engineer/Second Officers CABIN TEMP CONTROL
R panel, zone 215, check that RAM AIR indicators are in
R the full COOLER position. If not, position the ram air
R exhaust valves by performing the following steps:

R (a) Turn on electrical power (Ref. 24-00-00).

R (b) On CABIN TEMP CONTROL panel, place GND CONT - RAM
R AUTO switchlight in depressed (latched in)
R position.



R Dual Heat Exchanger Inspection Access
R Figure 601

R (2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers PACK 1 - AUTO/MAN - AC and DC, PACK 2 - AUTO/MAN - AC and DC, and PACK 3 - AUTO/MAN - AC and DC, as applicable.

R (3) Check outer face of heat exchanger visually through open exhaust valve.

R (4) Remove heat exchanger access panel 115AL (pack No. 1), 116AR (pack No. 2), or 116BR (pack No. 3), as applicable.

R (5) Visually check exterior of dual heat exchanger for dents, cracks, or other damage.

R (6) Reinstall heat exchanger access panel.

R (7) Open applicable inspection access panel (113DZ for pack No. 1, 113EZ for pack No. 2, or 113AZ for pack No. 3) in the aft bulkhead of the forward electronic service center.

R (8) Visually check outer face of ram air header check valve for signs of damage.

R (9) Use two foot section of dowel to hold open ram air header check valve flapper. Visually check inner face of heat exchanger for dirt and damage.

R NOTE: A long handle inspection mirror will be needed to check the forward end of the exchanger and header.

R (10) Visually check inside of header for signs of cracking or delamination.

R (11) Remove dowel and check that valve flapper closes freely.

R (12) Reinstall inspection panel.

R (13) Remove tags and close circuit breakers opened in Step 4A(2).

R (14) Remove tags installed at beginning of Paragraph 4.

DUAL HEAT EXCHANGER - CLEANING

1. Equipment and Materials

Shop air supply with a pressure of 50 psig

R Varsol, Grades 1, 3, or 18

Plastic Sheet

5 feet long rod padded at the ends

Cleaning Nozzle

2. Cleaning

WARNING: TAG FLIGHT ENGINEER-SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES. RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(1) Be sure that ram air doors are in the full open position.

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3 pull and tag PACK 1 AUTO-MNL DC (V5) for Pack 1, PACK 2 AUTO/MNL DC (V7) for Pack 2 and PACK 3 AUTO/MNL DC (V9) for Pack 3.

(3) Disconnect pin from ACM dome housing and slide inlet shell forward. Reference Figure 701.

(4) Disconnect machine screw and slide diffuser housing all the way into the heat exchanger header. Reference Figures 701 and 702.

(5) Soak ram air inlet side of the heat exchanger with Varsol.

(6) Install rod to secure ram air inlet check valve closed. Reference Figure 702.

(7) Slide diffuser housing back out of header and secure to ACM dome housing with machine screw.

(8) Attach and tape a plastic sheet around the inlet shell (that has been slid forward per Step 3) and the

diffuser housing. This is to prevent any heat exchanger contamination from re-entering the heat exchanger compartment since the cleaning airflow is reversed through the ACM fan.

(9) Connect cleaning nozzle to air supply of approximately 50 psig.

R WARNING: DO NOT SLIDE NOZZLE OVER THE THIN ALUMINUM FINS.

(10) Commence cleaning by directing the nozzle over the heat exchanger exhaust core surface area by going through each louver door opening and on each side of the louver's support rod.

NOTE: The only effective method for back-flushing the heat exchanger of contamination is to get the nozzle securely in contact with the heat exchanger core so the pressure cannot diffuse before it passes through the core.

(11) Go over the entire surface area thoroughly. The cleaning air discharge goes through the heat exchanger core, into the header, through the diffuser housing, into the ACM fan outlet port, through the dome housing, and then discharges into the ECS compartment where it goes overboard.

R WARNING: THE VACUUM LEAD MUST UTILIZE A SOFT BRISTLE BRUSH AND THAT CAUTION SHOULD BE EXERCISED TO PREVENT DAMAGE TO THE FINS.

(12) Move diffuser housing forward immediately after completion of high pressure cleaning of the core (back flush and quickly dry the diffuser support O-seal and surrounding area with a dry wiper using a high suction vacuum cleaner, vacuum any remaining unloosened debris from the ram inlet face of the heat exchanger. Also, vacuum any remaining debris from the ACM fan inlet and outlet faces.

R WARNING: VARSOL REACTS WITH SILICONE RUBBER TO CAUSE SWELLING AND TACKINESS. THIS IS A TIME FUNCTION AND IF WIPED DRY RIGHT AWAY, THERE SHOULD BE NO PROBLEM. IF NOT, IT MAY PREVENT REASSEMBLY, OR CAUSE AN UNDETECTABLE IMPROPER ASSEMBLY.

NOTE: The vacuum lead must utilize a soft bristle brush. Exercise caution to prevent damage to heat exchanger fins.

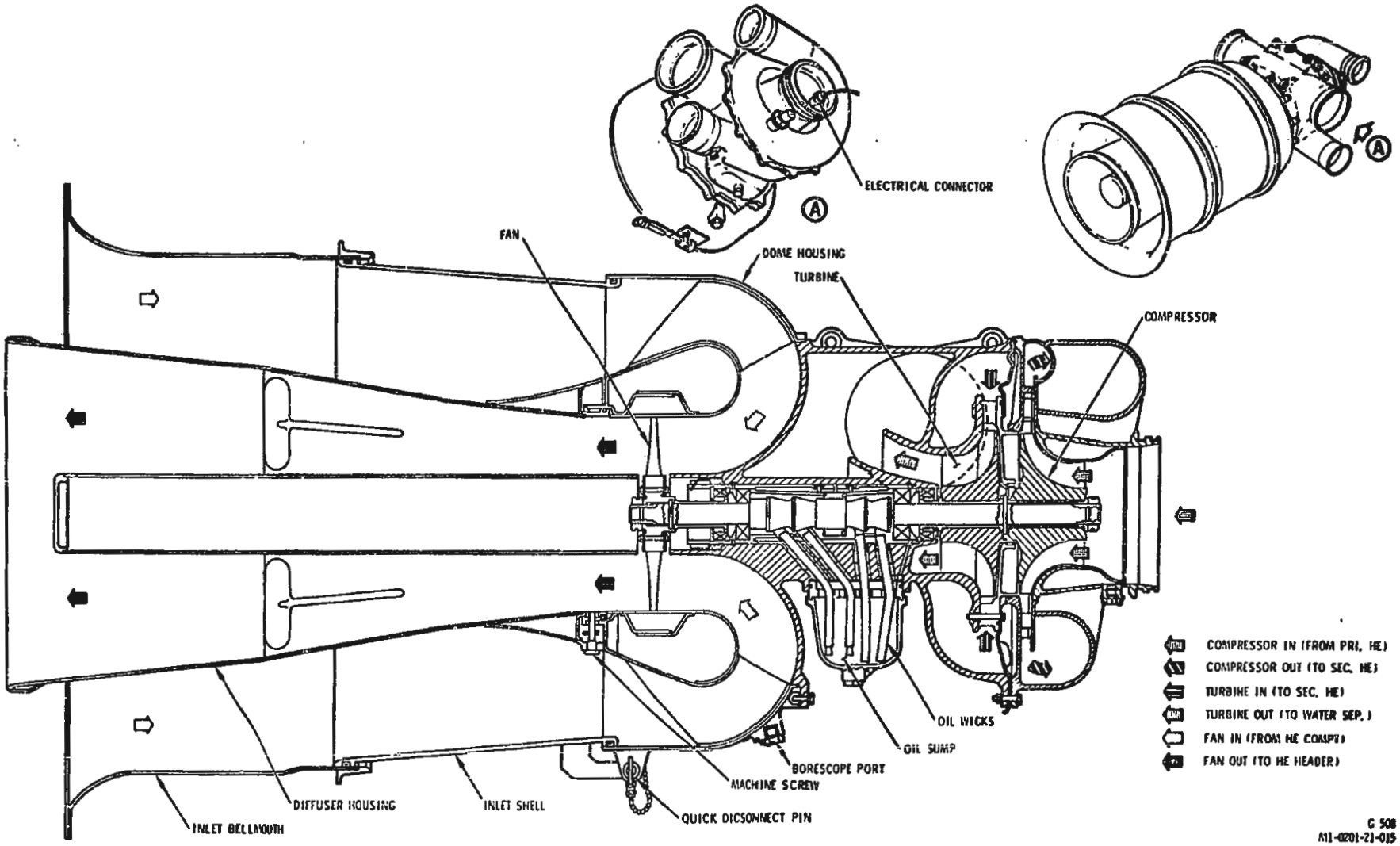
(13) Remove the header support rod installed in Step (6).

(14) Remove plastic sheet installed in Step (8).

(15) Reattach the diffuser housing to the ACM dome housing.

(16) Reattach the inlet shell to the dome housing.

(17) Reset C/B's pulled in Step (2), and remove warning tag installed in Step 2.

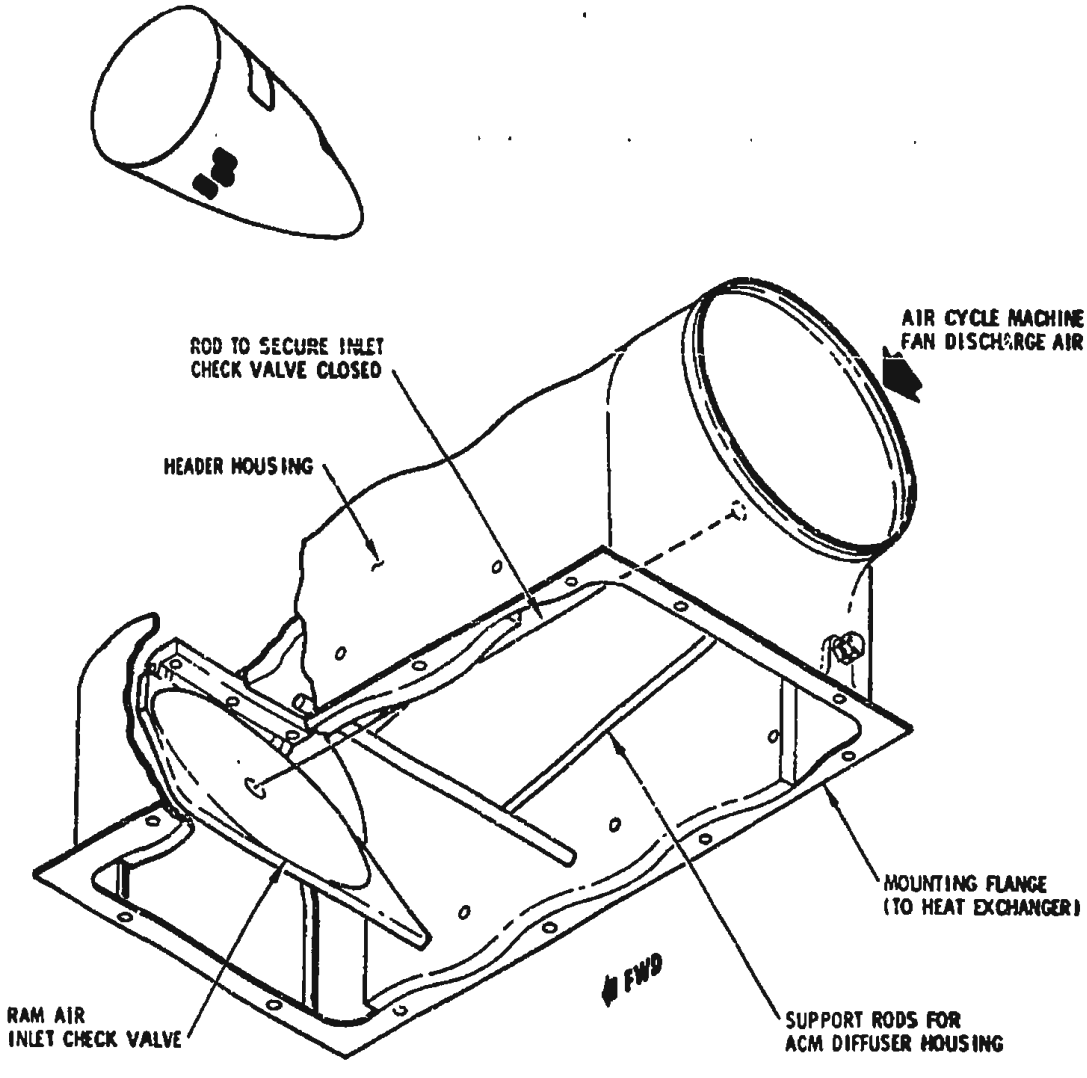


R
R

Air Cycle Machine
Figure 701

R
R
R
001B

EFFECTIVITY: ALL


ROD TO SECURE INLET CHECK VALVE CLOSED
AIR CYCLE MACHINE FAN DISCHARGE AIR
HEADER HOUSING
MOUNTING FLANGE (TO HEAT EXCHANGER)
FWD
RAM AIR INLET CHECK VALVE
SUPPORT RODS FOR ACM DIFFUSER HOUSING

M1-5500-21-073

CR
CR

Ram Cooling Header
Figure 702

EFFECTIVITY: ALL

001B

RAM COOLING HEADER AND CHECK VALVE - MAINTENANCE PRACTICES

1. General

R An operative ram cooling header and check valve is required for
R on ground use of an air cycle pack.

R A ruptured header, or a broken or stuck-open check valve would
R prevent proper on-ground cooling, and that air cycle pack must
R not be used on the ground. In-flight operation of that pack is
R possible, but should be monitored.

R Any loose pieces of the header or check valve must be removed
R prior to flight.

R 2. Maintenance Practices

R A. Deactivation

R (1) On Flight Engineer/Second Officers CABIN TEMP CONTROL
R panel, zone 215, release applicable PACK FLOW CONTROL
R switchlight to off position (out) and placard DO NOT
R OPERATE PACK ON GROUND.

R (2) Make appropriate entry in aircraft log.

RAM COOLING HEADER AND CHECK VALVE - REMOVAL AND INSTALLATION

1. Referenced Procedure

21-51-01 Dual Heat Exchanger - Removal and Installation

2. Removal/Installation

WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES. RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

The ram cooling header and check valve, the dual heat exchanger, and the ram air exhaust valve must be removed and installed as an assembly.

The No. 1 assembly is in zone 115. Access is provided through heat exchanger panel 115AL and environmental control system (ECS) access door 117AL. The No. 2 and No. 3 assemblies are in zone 116, with acess through panels 116AR, 116BR, and door 118CR.

The ram cooling header and check valve is removed or installed by following the procedure for the dual heat exchanger (Ref. 21-51-01).

R ## RAM COOLING HEADER AND CHECK VALVE - INSPECTION AND CHECK

R 1. General

R The ram air cooling header and check valve check is normally
R performed at the same time as the dual heat exchanger check. A
R separate check may be made by using the procedure outlined
R below. Access to the header and check valve is through
R inspection access panels in the aft bulkhead of the forward
R electronic service center (Ref. Fig. 601).

R Access to the No. 1, No. 2, and No. 3 headers is through access
R 113DZ, 113EZ, and 113AZ, respectively.

R 2. Equipment and Materials

R Dowel 1/4 to 1/2 inch diameter approximately 2 feet long

R 3. Inspection/Check

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU
R CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR
R CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL
R COMPLETION OF PROCEDURES. RECENT OPERATION OF
R AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS
R AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE
R GLOVES SHOULD BE USED WHEN REQUIRED.

R A. Check

R (1) Open applicable inspection access panel 113DZ, 113EZ,
R or 113AZ in aft bulkhead of forward electronic service
R center.

R (2) Visually check outer face of check valve for signs of
R damage.

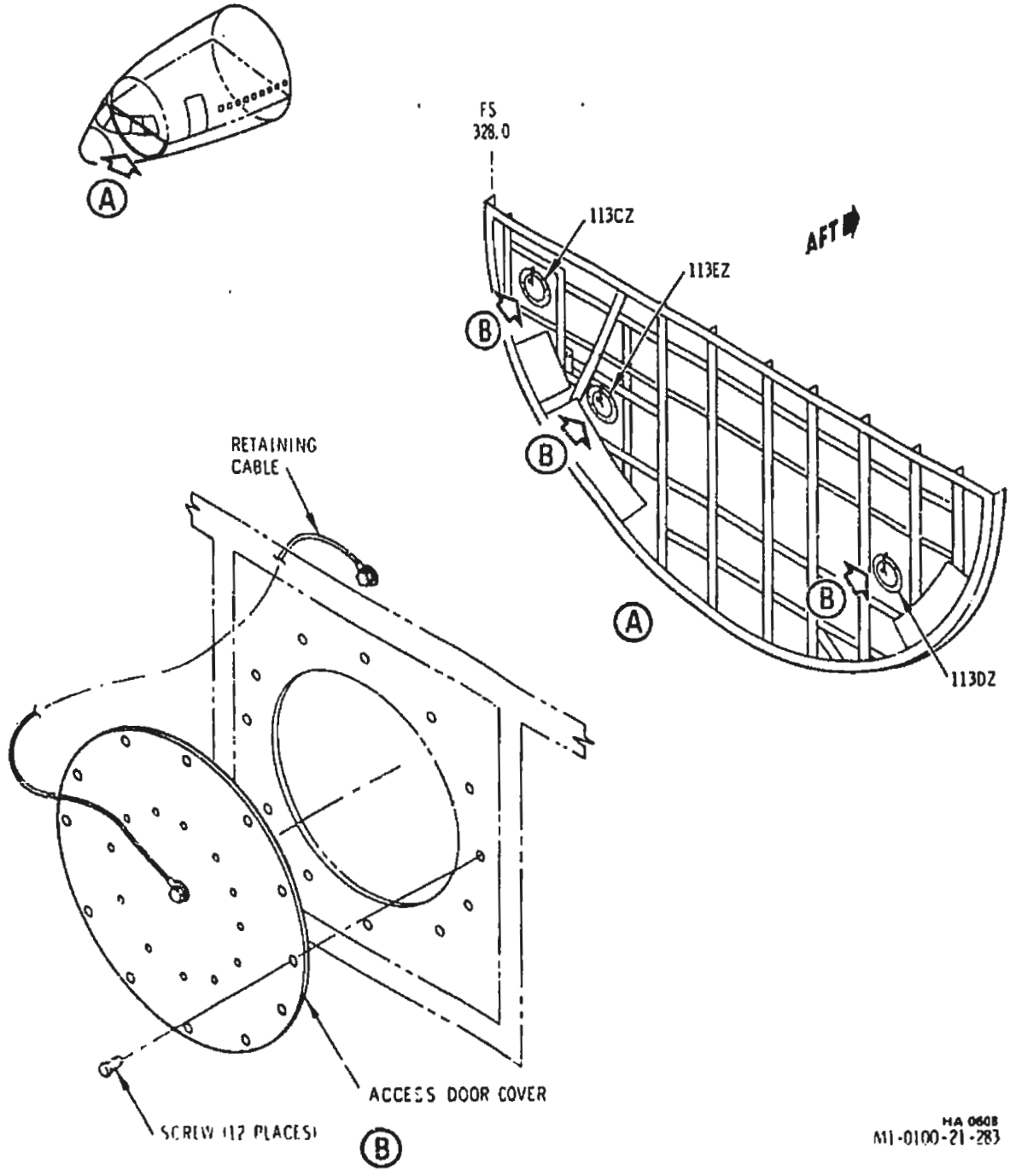
R (3) Use 2-foot section of dowel to hold open check valve
R flapper. Visually check inside of header for signs of
R cracking or delamination.

R NOTE: A long handle inspection mirror will be needed
R to check forward end of header.

R (4) Remove dowel rod and check that valve flapper closes
R freely.

R (5) Reinstall applicable inspection access panel.

R (6) Remove tags installed at beginning of Paragraph 3.



R Ram Cooling Header and Check Valve Access
R Figure 601

CR

AIR CYCLE MACHINE - MAINTENANCE PRACTICES

CR 1. General

CR Deactivation for only inoperative air cycle machine is accomplished by deactivation of the pack turbine bypass valve for that air cycle system. In air cycle system with inoperative component in addition to inoperative air cycle machine, deactivate associated pack flow control valve.

CR An air cycle cooling system with an inoperative air cycle machine must not be operated on the ground.

CR 2. Referenced Procedure

CR 21-21-01 Pack Flow Control Valve - Maintenance Practices

CR 21-62-16 Turbine Bypass Valve - Maintenance Practices

CR 3. Deactivation

CR A. In air cycle system with inoperative components in addition to inoperative air cycle machine, deactivate pack flow control valve as detailed in preceding 21-21-01 procedure.

CR B. One or two air cycle machines only inoperative

CR (1) In air system(s) that is fully operative except for inoperative air cycle machine, deactivate turbine bypass valve as detailed in 21-62-16 procedure.

CR NOTE: Do not remove electrical connector from turbine bypass valve.

CR (2) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, release applicable PACK FLOW CONTROL switchlight(s) to off (out) position and placard switchlight(s) AIR CYCLE MACHINE INOPERATIVE AND TURBINE BYPASS VALVE LOCKED OPEN - DO NOT OPERATE SYSTEM ON GROUND.

CR (3) Release applicable air cycle pack control AUTO - MNL switchlight(s) to MNL (out) position. Placard "Auto System Inop - Air Cycle Machine Inoperative".

CR (4) Make appropriate entry in aircraft log book.

AIR CYCLE MACHINE - REMOVAL AND INSTALLATION

1. General

The No. 1 air cycle machine (ACM) is in the left environmental control system (ECS) compartment, zone 117, with access through access door 117AL. The No. 2 and No. 3 ACM are in the right ECS compartment, zone 118, with access through access door 118CR. Removal and installation procedures are the same for all three ACM except for circuit breaker and access door references and as noted in procedure.

2. Equipment and Materials

O-ring (1) Parker 3-085604-7, or equivalent

Seals (2), Purolator 7541910, or equivalent

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Compound, corrosion preventive, MIL-C-16173, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Container, oil drain (1 quart minimum)

Protective caps and plug

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Lockheed tool no. 1514100-101 LF2 or equivalent

3. Referenced Procedures

R	6-40-00	Exterior Access Panels and Doors
	20-21-01	Flexible Swaged Coupling - Removal and Installation
	20-36-01	Single T-bolt V-band Coupling - Removal and Installation
	21-00-00	Air Conditioning System - Maintenance Practices
	12-12-31	Air Cycle Machine - Servicing

4. Removal/Installation

A. Removal

WARNING: FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THREE HIGH PRESSURE GROUND AIR CONNECTIONS MUST BE TAGGED TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

(1) On pilots overhead circuit breaker panel CB1, zone 210, open and tag applicable circuit breaker:

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 1 (H3),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 2 (H4),

ENVIR CONTROL SYSTEM - PACK - FLOW CONTROL - 3 (H5).

(2) Open applicable ECS compartment access door, 117AL (No. 1 ACM), or 118CR (No. 2 or No. 3 ACM) (Ref. 6-40-00).

(3) Position container below ACM drain port, remove drain plug and drain oil from sump (Ref. Fig. 401). Replace drain plug.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(4) Disconnect electrical cable connector from compressor overtemperature switch receptacle (below compressor inlet) and install protective caps on connector and receptacle.

R

(5) Remove sensor from ACM, discard O-ring, and install protective plug in sensor boss.

(6) Disconnect electrical cable clamps and standoffs from ACM and stow cable to prevent damage.

(7) Release quick disconnect pin at bottom of ACM, to release fan inlet shell, and telescope inlet shell forward (Ref. Fig. 401).

(8) Loosen machine screw holding fan discharge diffuser at ACM dome housing and slide diffuser forward into heat exchanger header.

CAUTION: DO NOT DISTURB TIE-ROD LENGTH OR VIBRATION DAMPER ADJUSTMENTS.

(9) At bottom of ACM mount, on each side of the ACM, remove two tie-rod assemblies as follows (Ref. Fig. 402):

(a) At aft end of tie-rod, securely hold tie-rod to prevent rotation from vertical position and remove nut and stop from shock mount stud.

(b) At forward end of tie-rod, remove nut, bolt, and bushing through eye-bolt end of tie-rod and ACM mount support arm.

(c) Slide tie-rod aft, off shock mount stud.

(d) Verify position identification stencil on tie-rod is legible and agrees with position removed from, for reinstallation.

(10) Disconnect turbine discharge duct from ACM (Ref. Fig. 401):

(a) Remove band clamp securing flexible seal to ACM connection.

(b) Work seal loose from ACM, moving duct away from ACM for clearance.

(11) For No. 2 or No. 3 ACM only, disconnect turbine discharge duct from water separator.

(a) Remove band clamp securing seal to water separator connection.

(b) Work seal loose from water separator and remove duct from ECS compartment.

(12) For clearance to remove No. 3 ACM, remove No. 2 ACM turbine discharge duct [Ref. Steps 4A(10) and 4A(11)].

(13) Disconnect compressor inlet duct from ACM:

(a) Remove two anti-rotation springs connecting retainer to fitting below compressor inlet.

(b) Remove two bolts from retainer joint, hinge retainer open and remove retainer.

(c) Slide metal sleeve from over duct and ACM connection flanges, back onto duct.

(14) Disconnect compressor discharge duct from ACM:

(a) Disconnect single T-bolt V-band coupling (Ref. 20-36-01).

(b) Move coupling from over duct and ACM connection flanges, back onto duct.

(15) Disconnect turbine inlet duct from ACM:

(a) Cut lockwire and disconnect flexible swaged coupling (Ref. 20-21-01). Use two strap wrenches on coupling if necessary.

(b) Slide coupling nut, washer, and O-ring back onto ACM (cut and discard O-ring if necessary).

(c) Slide coupling body, washer, and O-ring back onto duct (cut and discard O-ring if necessary).

(d) Remove two-piece retainer from over duct and ACM connection flanges.

(16) Disconnect turbine bypass duct from ACM:

(a) Disconnect two band clamps securing seal over duct and ACM connection and slide clamps back onto duct.

(b) Work seal off end of ACM connection onto duct, far enough to expose end of ACM connection.

WARNING: AIR CYCLE MACHINE WEIGHT REQUIRES TWO MEN DURING REMOVAL.

R R (17) Support ACM and remove four self-locking nuts, securing ACM and shock mount to the aircraft structure.

R R R (18) Lower ACM with shock mount straight down until clear of ducts and mount. Remove ACM from compartment, and place on padded work surface. Remove four bolts securing shock mount to ACM and separate shock mount from ACM.

(19) Remove flexible swaged coupling components from turbine inlet duct and ACM connection and discard O-rings.

(20) Remove seal from turbine bypass duct.

(21) Remove metal sleeve and seals from compressor inlet duct and ACM connection and discard seals.

(22) Install protective caps on exposed ends of ducts and ACM and water separator connections.

B. Installation

(1) Verify that tags previously installed on FE/SO BLEED AIR and APU CONTROLS panels and the three high-pressure ground air connections are in place.

(2) Verify circuit breaker opened in Step 4A(1) is open and tagged.

WARNING: USE SOLVENT IN WELL VENTILATED AREA, DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

(3) Use solvent to clean ACM mounting bolts and mounting fittings on top of ACM and in shock mount assembly (Ref. Fig. 401 and 402). Inspect for damage and replace any damaged component.

WARNING: DO NOT ALLOW COMPOUND TO CONTACT EYES. PROLONGED EXPOSURE MAY RESULT IN EYE IRRITATION KEEP COMPOUND AWAY FROM HEAT, SPARKS OR OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(4) Brush coat ACM mounting bolts and all contacting surfaces of ACM and mount fittings with corrosion preventive compound.

WARNING: USE SOLVENT IN WELL VENTILATED AREA, DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

(5) Remove protective caps and use solvent to clean all exposed duct and ACM connection flanges. Inspect for damage and replace any damaged component.

WARNING: USE SOLVENT IN WELL VENTILATED AREA DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITAITON.

(6) Use solvent to clean all removed coupling components except seals and new O-rings. Wipe these components clean with soft dry cloth. Inspect for damage or deterioration and replace any damaged or deteriorated component.

(7) Lubricate coupling components:

(a) Turbine inlet: 2 new O-rings, 2 washers, 1 two-piece retainer, and threads of body and nut. Wipe all lubricant from wrenching surfaces of body and nut.

(b) Compressor inlet: 2 new seals and interior of metal sleeve.

(8) Install metal sleeve over flange onto compressor inlet duct (Ref. Fig. 401).

(9) Install seal between double flanges on compressor inlet duct.

(10) Verify two band clamps are on turbine bypass duct.

(11) Carefully slide seal over flange onto turbine bypass duct.

(12) Install coupling body, one washer, and one O-ring over flange onto turbine inlet duct. Slide washer and O-ring into body.

(13) Verify single T-bolt V-band coupling is on compressor discharge duct.

(14) Verify fan discharge diffuser is in position in heat exchanger header and fan inlet shell is in telescoped position.

(15) Install seal between double flanges on ACM compressor inlet connection.

(16) Install coupling nut, one washer, and one O-ring over flange onto ACM turbine inlet connection. Slide washer and O-ring into nut.

R WARNING: AIR CYCLE MACHINE WEIGHT REQUIRES TWO MEN DURING
R INSTALLATION, UNTIL SELF-LOCKING NUTS ARE
R INSTALLED.

R CAUTION: CAREFULLY MAINTAIN CLEARANCE BETWEEN ACM AND
R SURROUNDING MOUNT AND DUCTS.

R (17) Install shock mount on ACM with four horizontal bolts.
R Raise ACM with shock mount into position and install
R with four self-locking nuts.

R NOTE: Tolerance on align between center of ACM with
R ACM shroud inlet hole centerline in FS378

R bulkhead is ±.03 inch. Lockheed tool No. 1514100-101 LF2 may be used to obtain the required alignment.

(18) Connect turbine bypass duct to ACM:

(a) Carefully slide seal from duct onto ACM connection until seal is centered over duct and ACM flanges.

(b) Position duct for best alignment and move band clamps into position on seal, near the shoulders at each end of the seal, between the shoulders and duct and ACM flanges.

(c) Verify duct and ACM flanges are not under band clamps and clamps are properly positioned. Torque clamps 50 to 60 lb in.

(19) Connect turbine inlet duct to ACM:

(a) Install two-piece retainer over duct and ACM connection flanges.

(b) Align duct to ACM so retainer is fully closed and mate flexible coupling components over retainer.

(c) Torque and lockwire coupling (Ref. 20-21-01).

(20) Connect compressor discharge duct to ACM:

(a) Align duct to ACM and move single T-bolt V-band connector from duct to over duct and ACM connection flanges.

(b) Torque coupling (Ref. 20-36-01).

(21) Connect compressor inlet duct to ACM:

(a) Align duct to ACM and slide metal sleeve from duct to over flanges and seals on duct and ACM connection.

(b) Install hinged retainer over sleeve.

(c) Install two bolts in retainer and tighten bolts.

(d) Install two anti-rotation springs connecting retainer to fitting below compressor inlet.

(22) For No. 2 or No. 3 ACM, connect turbine discharge duct to water separator:

(a) Place band clamp over water separator connection.

(b) Verify correct end of duct, then lightly lubricate interior of flexible seal and work seal onto water separator connection.

(c) Align other end of duct at ACM connection, install band clamp securing seal to water separator connection and torque band clamp 50 to 60 lb in.

(23) Connect turbine discharge duct to ACM:

(a) Place band clamp over ACM connection.

(b) Lightly lubricate interior of flexible seal and work seal onto ACM connection.

(c) Install band clamp securing seal to ACM connection and torque band clamp 50 to 60 lb in.

(24) For No. 3 ACM, install No. 2 ACM turbine discharge duct removed for access to No. 3 ACM. Repeat Steps 4B(22) and 4B(23).

CAUTION: DO NOT DISTURB TIE-ROD LENGTH OR VIBRATION DAMPER ADJUSTMENTS.

(25) At bottom of ACM mount, install two tie-rod assemblies as follows (Ref. Fig. 402):

(a) Verify position by identification stencil on the rod, and install aft end of the rod on shock mount stud on aft ACM mount, holding tie rod horizontal, with aft leg of tie rod up.

(b) Install stop over hex portion of stud, into recess in vertical leg of tie-rod.

(c) Securely hold tie rod, to prevent rotation from vertical position, and install and tighten nut securing tie-rod to shock mount stud.

(d) Install bolt and bushing securing forward (eye-bolt) end of tie-rod to forward ACM mount.

(e) Verify eye-bolt end of tie-rod will move laterally in mount arm. If necessary, adjust eye-bolt in tie-rod to obtain lateral movement. Tighten and lock wire nuts if adjustment changed.

(f) Install and tighten nut on bolt through forward end of tie-rod and mount arm.

(26) Slide fan discharge diffuser aft, out of heat exchanger header, rotate to align marks on diffuser and on ACM housing, and tighten machine screw at bottom, securing diffuser to ACM. Torque screw 10 to 15 lb in. and lockwire.

(27) Slide telescoped inlet shell aft, rotate to align with ACM, and install quick disconnect pin securing shell at bottom of ACM.

(28) Install electrical cable clamps and standoffs on ACM as removed in Step 4A(6).

(29) Install new O-ring on compressor overtemperature switch.

(30) Remove protective plug and install switch in boss in compressor housing, below compressor inlet.

(31) Remove protective caps and connect electrical cable connector to over temperature switch receptacle.

(32) Service ACM with oil (Ref. 12-12-31).

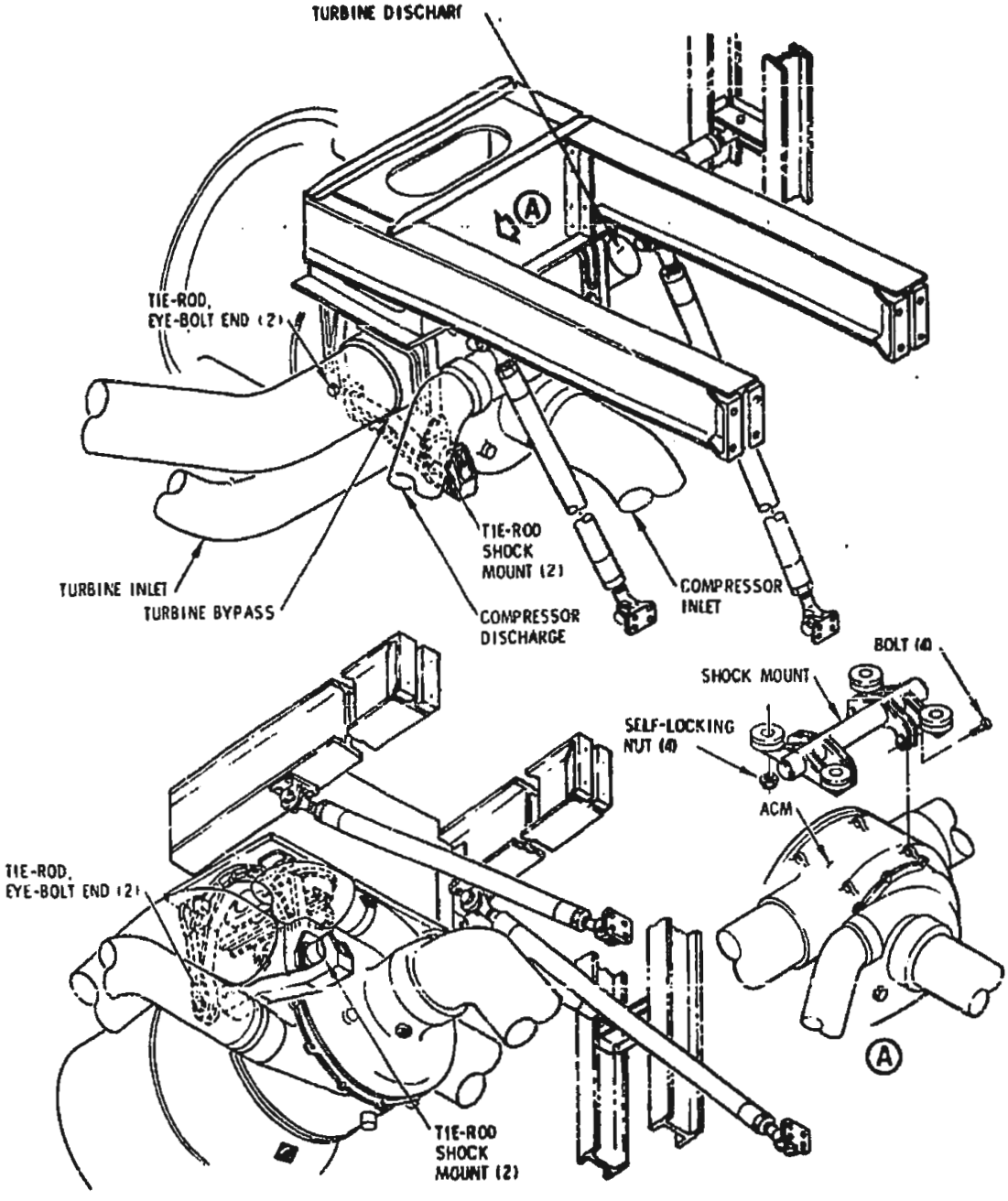
(33) Remove WARNING tags installed in Paragraph 4.

(34) Remove tag and close circuit breaker opened in Step 4A(1).

(35) Turn on air conditioning system (Ref. 21-00-00) to operate applicable air cycle pack(s). Check all disturbed connections for leaks and ACM for proper operation.

(36) Turn off air conditioning system (Ref. 21-00-00).

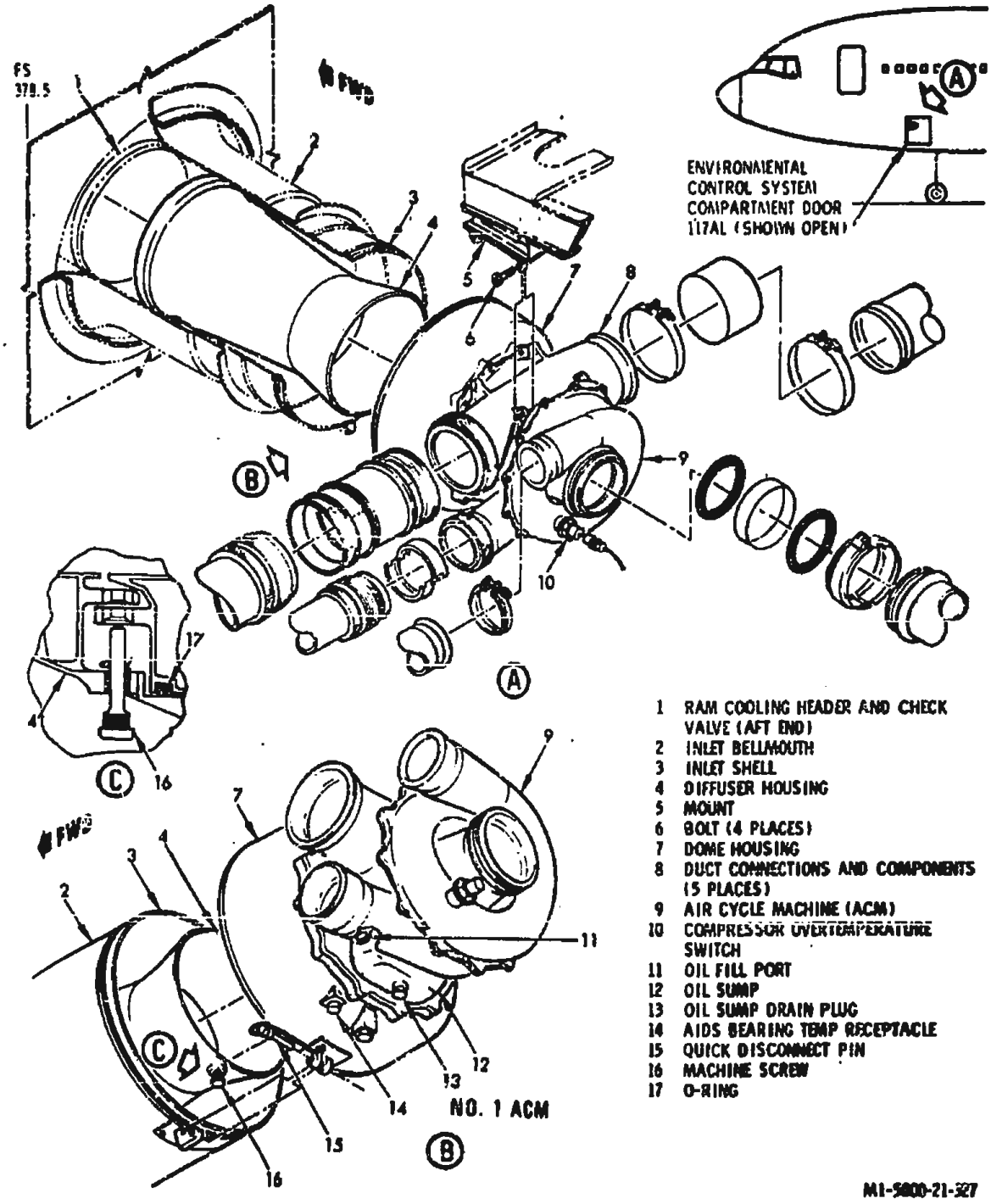
(37) Close ECS compartment access door (Ref. 6-40-00).



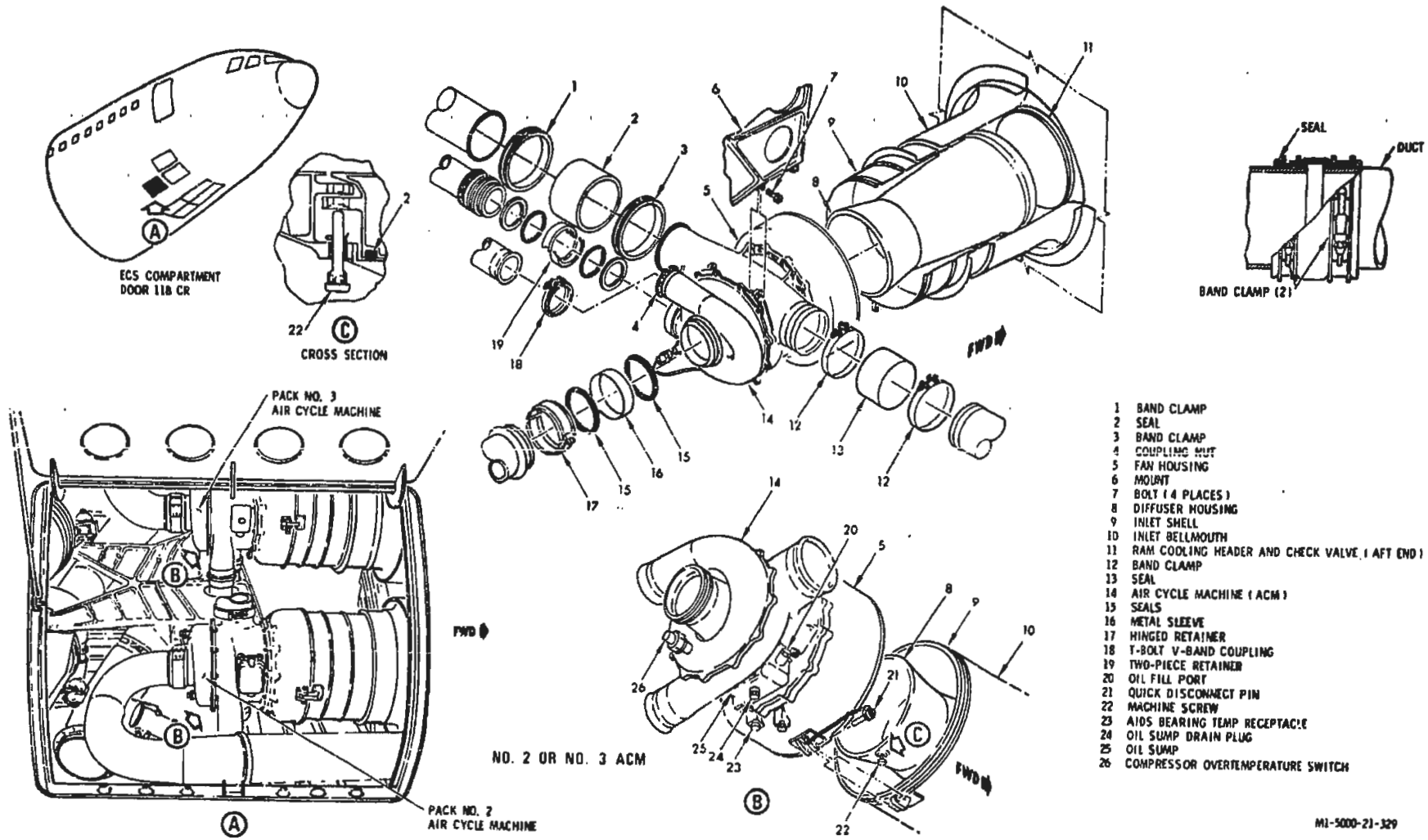
M1-0001-21-346

R Air Cycle Machine - Removal and Installation
R Figure 401 (Sheet 1)

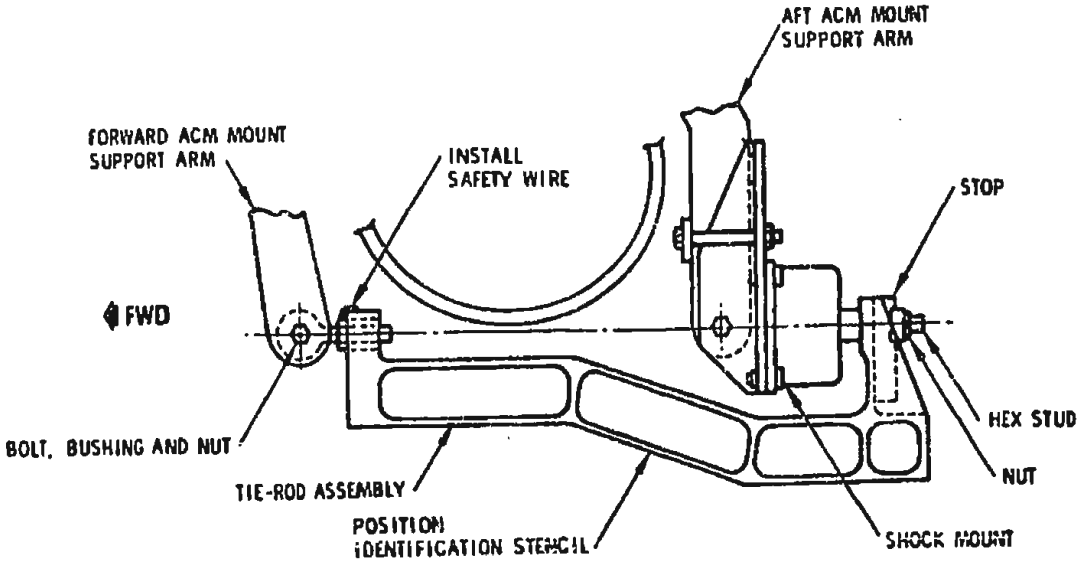
EFFECTIVITY: ALL



Air Cycle Machine - Removal and Installation
Figure 401 (Sheet 2)



Air Cycle Machine - Removal and Installation
Figure 401 (Sheet 3)



ACM Shock Mount Tie-Rod Installation
Figure 402

AIR CYCLE MACHINE - INSPECTION AND CHECK

1. General

Borescope inspection (Ref. Para. 4A) of the interior of the air cycle machine (ACM) is normally made only if foreign object damage is suspected or to determine if deterioration of pack operation is caused by the ACM or the heat exchanger.

A check (Ref. Para. 4B) of the ACM oil level and general condition should be made in accordance with airline time limits and maintenance standards and whenever the environmental control system (ECS) compartment is opened.

2. Equipment and Materials

R Borescope, American Cystoscope Model B1413A, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Preformed Packing, Hamilton Standard PN 69494J11, or equivalent

3. Referenced Procedure

R 12-12-31 Air Cycle Machine - Servicing

4. Inspection/Check

R WARNING: FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND
R APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND
R AIR CONNECTIONS MUST BE TAGGED TO PREVENT SYSTEM
R OPERATION UNTIL COMPLETION OF PROCEDURE.

A. Inspection

(1) Open applicable ECS compartment door (117AL for pack No. 1, or 118CR for pack No. 2 or No. 3).

R WARNING: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED
R WHEN REQUIRED.

(2) Remove the borescope inspection port plugs on the bottom of the compressor inlet, turbine inlet scroll, and dome housing. Remove and discard packings from plugs.

(3) Borescope-inspect for interior damage, especially:

(a) Nicks, dents, or cracks in compressor and turbine rotor blades.

(b) Erosion or turbine inlet nozzle damage.

(c) Dents or scratches in housing or scroll surfaces

(d) Nicks, dents, or cracks in fan blades.

(4) Install new packing on inspection port plugs and reinstall plugs in ACM. Lock-wire plugs.

(5) Perform check Steps 4B(2) through 4B(5).

B. Check

(1) Open applicable ECS compartment door (117AL for pack No. 1, or 118CR for pack No. 2 or No. 3).

(2) Check water level in bottom of ACM sump. If the water level exceeds 1/2 inch, the sump should be drained and
R replenished (Ref. 12-12-31, Servicing).

(3) Check oil level in ACM sump. If below the ADD OIL
R line, replenish (Ref. 12-12-31, Servicing).

(4) Check ACM exterior for damage, especially:

(a) Oil leakage

(b) Broken or damaged lock-wire

(c) Good mounting and duct connections

(d) Condition of electrical wiring

(5) Close ECS compartment door.

R (6) Remove tags installed at beginning of Step 4A(1).

COMPRESSOR BYPASS CHECK VALVE - REMOVAL AND INSTALLATION

1. General

Removal and installation procedures are the same for all three compressor bypass check valves except for access door references. The No. 1 system compressor bypass check valve is in the left environmental control system (ECS) compartment, zone 117, with access through access door 117AL. The No. 2 and No. 3 system valves are in the right ECS compartment, zone 118, with access through access door 118CR.

2. Equipment and Materials

Seals (2), Purolater 7541912, or equivalent

O-ring (1), MS9068-256, or equivalent

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Protective caps

3. Referenced Procedures

20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation

R WARNING: FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU
R CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR
R CONNECTIONS MUST BE TAGGED TO PREVENT SYSTEM OPERATION
R UNTIL COMPLETION OF PROCEDURE.

A. Removal

(1) Open applicable ECS compartment access door, 117AL for system No. 1 valve or 118CR for system No. 2 or No. 3 valve (Ref. Fig. 401).

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (2) Disconnect single T-bolt V-band coupling at inlet end of valve (Ref. 20-36-01) and move coupling back onto duct.

R (3) Remove hinged retainer from over valve discharge and duct connection.

R (4) Loosen metal sleeve over valve discharge and duct connection and slide sleeve back onto duct.

R (5) Remove O-ring from between valve inlet and duct flanges and discard O-ring.

R (6) Remove valve from aircraft.

R (7) Remove seals (2) from valve discharge flange and from duct flange and discard seals.

R (8) Install protective caps on exposed ends of ducts and valve.

R B. Installation

R (1) Remove protective caps from ends of ducts and valve, wipe mating surfaces clean, and verify duct and valve flanges are undamaged. Repair or replace damaged components.

R (2) Verify single T-bolt V-band coupling is on valve inlet duct.

R (3) Remove metal sleeve from valve discharge duct, wipe clean, and verify sleeve is undamaged. Replace sleeve if damaged.

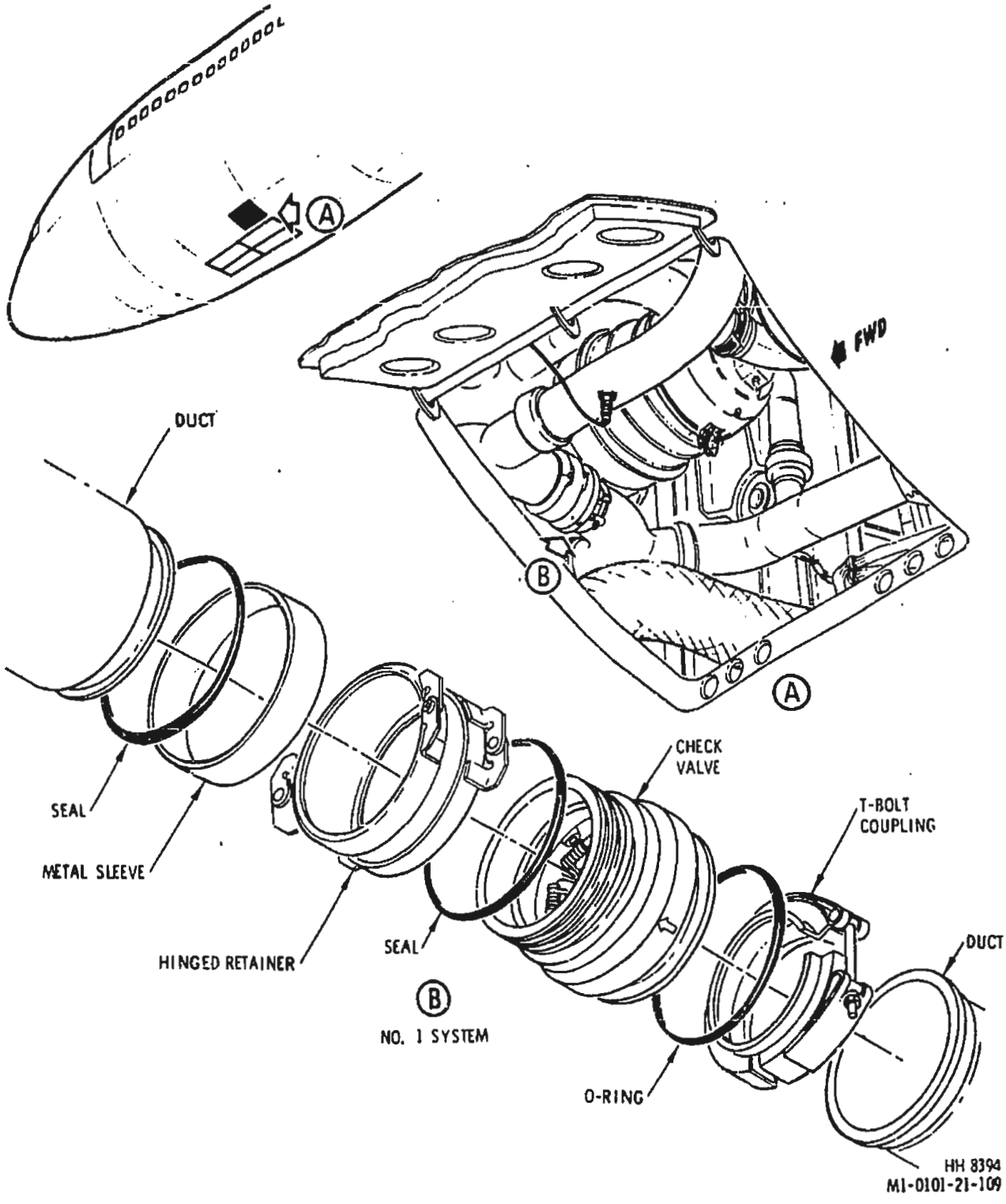
R (4) Lightly lubricate O-ring, two seals, and interior of metal sleeve.

R (5) Install sleeve over discharge duct flanges, back onto duct.

R (6) Install one seal between flanges on end of valve discharge duct and one between flanges on discharge end of valve.

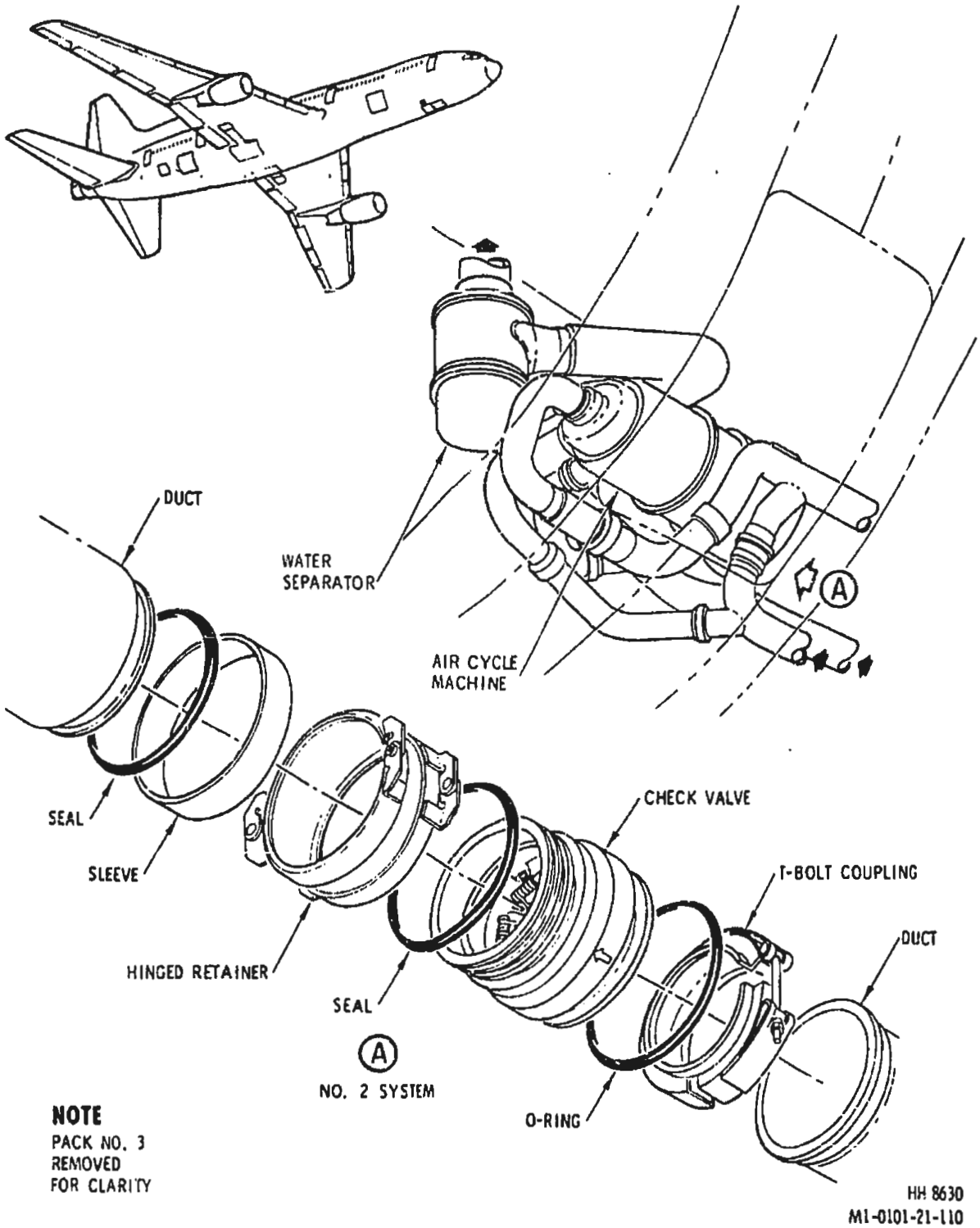
R (7) Slide valve into position between duct ends, with flow arrow pointing outboard (System No. 1) or down (System No. 2 or No. 3).

R (8) Slide metal sleeve from duct, into position over seals in valve discharge duct and flanges.

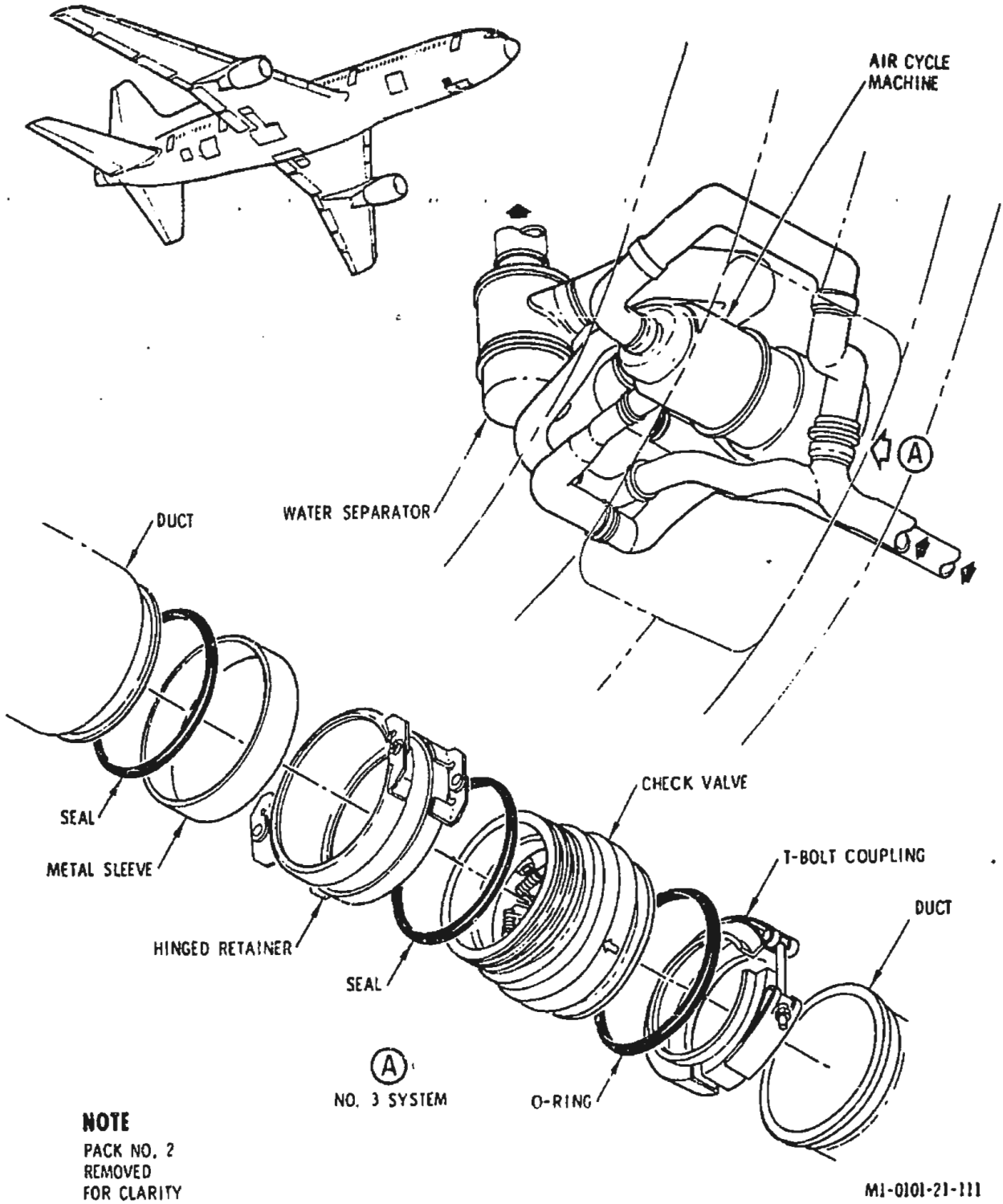


R Compressor Bypass Check Valve - Removal and Installation
R Figure 401 (Sheet 1)

EFFECTIVITY: ALL



R Compressor Bypass Check Valve - Removal and Installation
R Figure 401 (Sheet 2)



R Compressor Bypass Check Valve - Removal and Installation
R Figure 401 (Sheet 3)

R EFFECTIVITY: ALL

R
R
001B

(9) Install hinged retainer over metal sleeve.

(10) Move valve against discharge duct to obtain clearance between valve inlet and duct flanges, and slide O-ring into position between valve and duct ends.

(11) Install single T-bolt V-band coupling over valve inlet and duct flanges and O-ring (Ref. 20-36-01).

R (12) Remove WARNING tags installed in Paragraph 4.

(13) Turn on air conditioning system (Ref. 21-00-00).

(14) Operate applicable air cycle cooling system, checking duct and valve connections for leakage and system for proper valve operation.

(15) Turn off air conditioning system (Ref. 21-00-00).

(16) Close ECS compartment access door.

PACK DISCHARGE CHECK VALVES - REMOVAL AND INSTALLATION

1. General

The three pack discharge check valves are in the right environmental control system (ECS) compartment, zone 118, immediately aft of the FS 378 bulkhead. Access is through ECS compartment access door 118CR. Pack No. 1 valve is mounted inboard, with pack No. 2 valve in the center, and pack No. 3 valve in an outboard position. Removal and installation
R procedures are the same for all valves except as noted.

2. Equipment and Materials

Lubricant, now-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Protective caps

Thread, Fed Spec V-T-285, Type E, Class I, or equivalent

3. Referenced Procedure

20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices
R 21-51-07	Air Cycle Machine - Removal and Installation

4. Removal/Installation

WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE. RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

A. Removal

(1) Open ECS compartment access door 118CR.

R NOTE: When removing Pack No. 1 check valve, removal of
R No. 3 ACM is required (Ref. 21-51-07).

(2) Remove cover from valve (Ref. Fig. 401).

(3) Disconnect band clamp securing seal at aft end of valve to valve inlet duct. Slide band clamp aft onto duct.

(4) Disconnect single T-bolt V-band coupling at forward end of valve (Ref. 20-36-01). Slide coupling forward onto duct.

(5) Work seal free of duct flange, and remove valve from aircraft with seal attached.

(6) Disconnect band clamp securing seal to valve and remove seal and clamp from valve.

(7) Install protective caps on exposed ends of ducts and valve.

B. Installation

(1) Remove protective caps from ends of ducts and valve, wipe mating surfaces clean, and verify duct and valve flanges are undamaged. Repair or replace damaged components.

(2) Verify single T-bolt V-band coupling is on duct forward of valve position and band clamp on duct aft of valve position.

(3) Lightly lubricate interior of seal and install seal on valve inlet flange.

(4) Install band clamp securing seal to valve. Torque band clamp 50 to 60 lb in.

(5) Install valve, working seal onto valve inlet duct aft of valve position.

(6) Install single T-bolt V-band coupling at forward end of valve (Ref. 20-36-01).

(7) Install band clamp securing seal to valve inlet duct. Torque clamp 50 to 60 lb in.

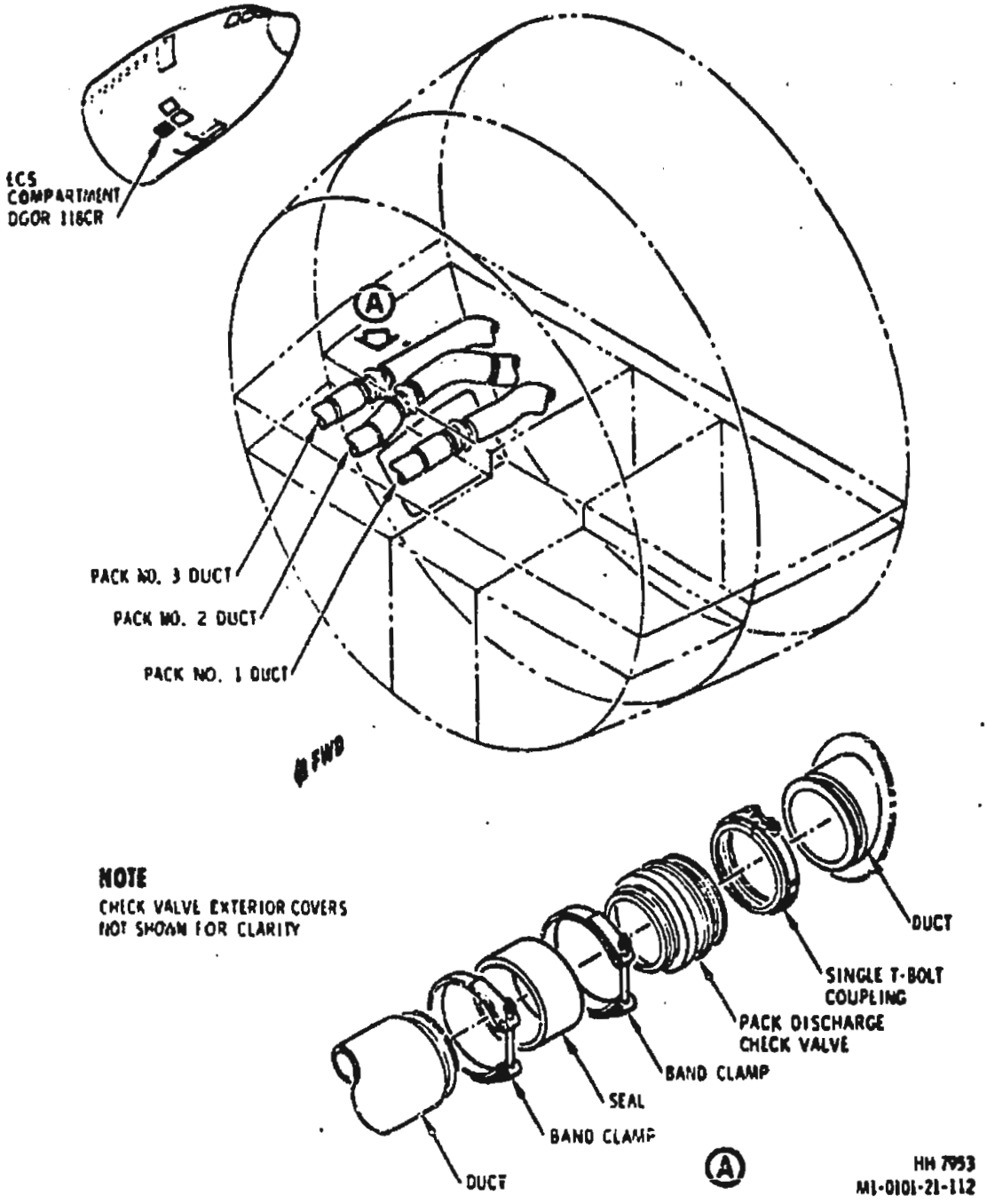
(8) Remove WARNING tags installed in Step 4.

R NOTE: Install No. 3 ACM if required (Ref. 21-51-07).

(9) Turn on air conditioning system (Ref. 21-00-00).

(10) Operate applicable air cycle system and check valve and duct connections for leakage.

(11) Turn off air conditioning system (Ref. 21-00-00).



Pack Discharge Check Valve - Removal and Installation
Figure 401

(12) Install valve cover removed in Step 4A(2).

(13) Close ECS compartment access door.

R **COLD AIR PLENUM RELIEF VALVE - REMOVAL AND INSTALLATION**

1. **Equipment and Materials**

   Gasket, Lockheed PN 1522344-101, or equivalent

2. **Referenced Procedures**

   6-50-00 Internal Access Doors and Panels - Removal and Installation

   53-22-00 Cabin Floor Panels - Removal and Installation

3. **Removal/Installation**

   A. Removal

   WARNING: PLACARD FLIGHT ENGINEERS/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

   RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

   (1) In passenger compartment area opposite the P-2 door, remove internal access panel 224EB (Ref. 6-40-00 and 53-22-00).

   (2) Remove screws and washers attaching relief valve to plenum assembly.

   (3) Remove relief valve and gasket from aircraft.

   B. Installation

   WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

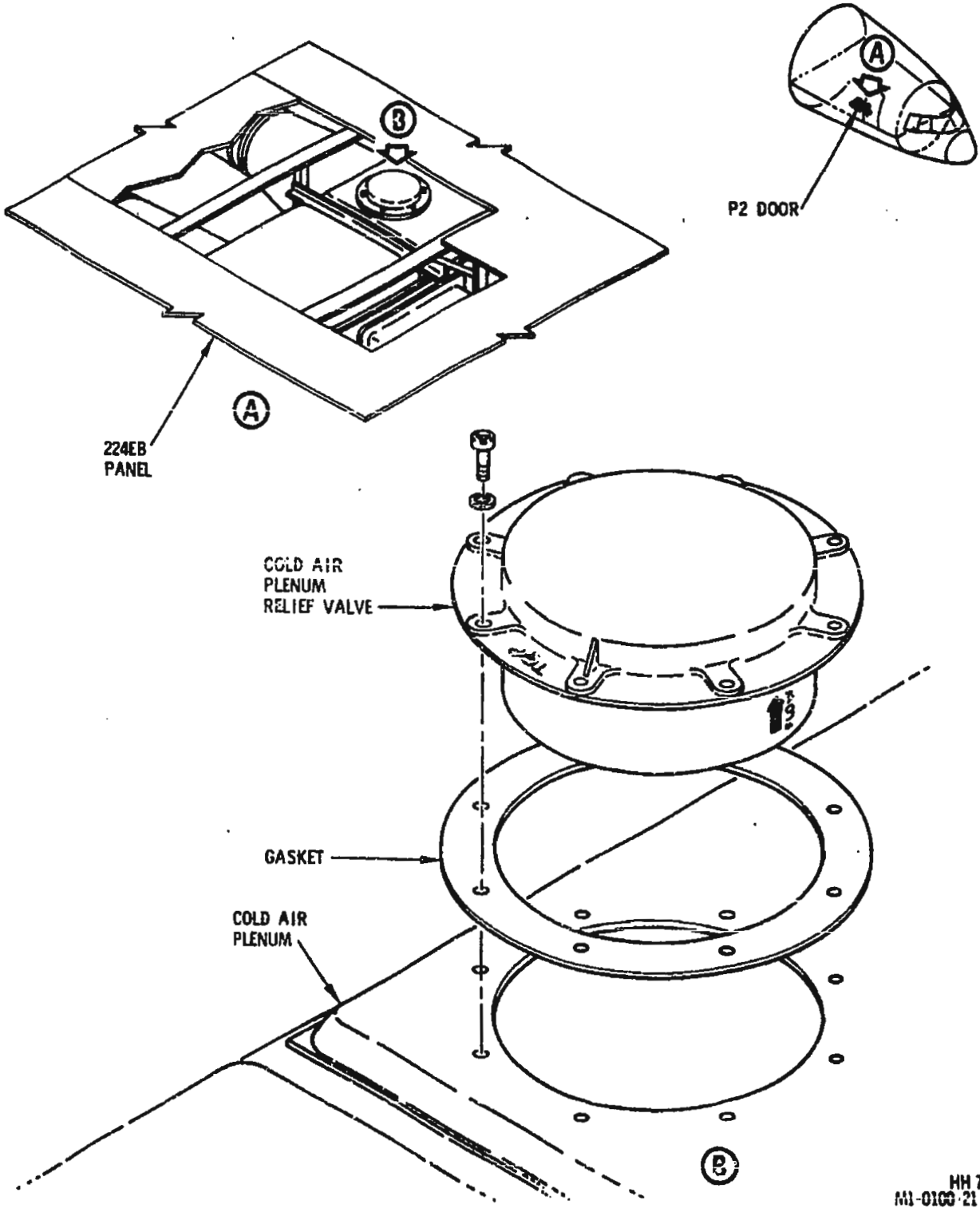
   (1) Install a new gasket on top of plenum assembly and over relief valve hole.

   (2) Position relief valve with word TOP (cast on valve flange) facing upward on top of gasket.

(3) Install washers and screws to mount relief valve to plenum assembly.

(4) Install internal access panel 224EB (Ref. 6-40-00 and 53-22-00).

(5) Remove placards installed at beginning of Paragraph 3.



Cold Air Plenum Relief Valve - Removal and Installation
Figure 401

WATER SEPARATOR - REMOVAL AND INSTALLATION

1. General

Removal and installation procedures are the same for all three water separators except for access door and circuit breaker references. The No. 1 system water separator is in the left environmental control system (ECS) compartment, zone 117, with access through access door 117AL. The No. 2 and No. 3 system water separators are in the right ECS compartment, zone 118, with access through access door 118CR.

2. Equipment and Materials

O-ring (1), MS28778-6, or equivalent

Gaskets (2), MAS 1596-4 or equivalent

Protective caps and plugs

3. Referenced Procedure

21-00-00 Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

NOTE: Concerning Steps 4A(3), 4A(4), and 4A(15), a pack ice sensor may not be installed. If an ice sensor is not installed, disregard those unnecessary procedures that pertain only to the ice sensor and ensure that a blocking plate is substituted in place of an ice sensor.

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the applicable following circuit breakers:

R PACK NO. 1 - AUTO/MAN - DC (V5),

R PACK NO. 1 - AUTO/MAN - AC (V6),

R PACK NO. 2 - AUTO/MAN - DC (V7),

R PACK NO. 2 - AUTO/MAN - AC (V8),

R PACK NO. 3 - AUTO/MAN - DC (V17),

R PAC NO. 3 - AUTO/MAN - AC (V18).

(2) Open applicable ECS compartment access door, 117AL for No. 1 system water separator or 118CR for No. 2 or No. 3 system water separator.

(3) Disconnect electrical cable connector from pack ice sensor receptacle on water separator (Ref. Fig. 401).

(4) Install protective caps on cable connector and on receptacle and stow cable to prevent damage.

(5) Disconnect water drain line from fitting on water separator.

(6) Install protective plug in drain line and cap on fitting.

(7) Disconnect AIDS pressure sensor line from fitting on water separator.

(8) Install protective plug in sensor line and cap on fitting.

(9) Remove two band clamps securing seal on duct and water separator inlet connection.

(10) Remove two band clamps securing seal on duct and water separator discharge connection. Slide clamps back onto duct.

(11) Loosen seals on ducts and on water separator, and slide seals from over connection, back onto ducts.

(12) Support water separator and disconnect band clamps attaching water separator to support structure.

(13) Remove water separator from compartment and place on padded work surface.

(14) Install protective caps on exposed duct and water separator openings.

(15) Remove pack ice sensor from water separator and install protective cover over exposed sensor ports on water separator and ice sensor.

(16) Remove water drain line fitting from water separator, remove and discard O-ring, and install protective plug in water separator port.

(17) Remove AIDS sensor line fitting from water separator, remove and discard gaskets (2), and install protective plug in water separator port.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

NOTE: Concerning Steps 4B(8), 4B(9), and 4B(23), a pack ice sensor may not be installed. If an ice sensor is not installed, disregard those unnecessary procedures pertaining only to the ice sensor and ensure that a blocking plate is substituted in place of an ice sensor.

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Remove protective caps from water separator inlet and discharge ducts in ECS compartment.

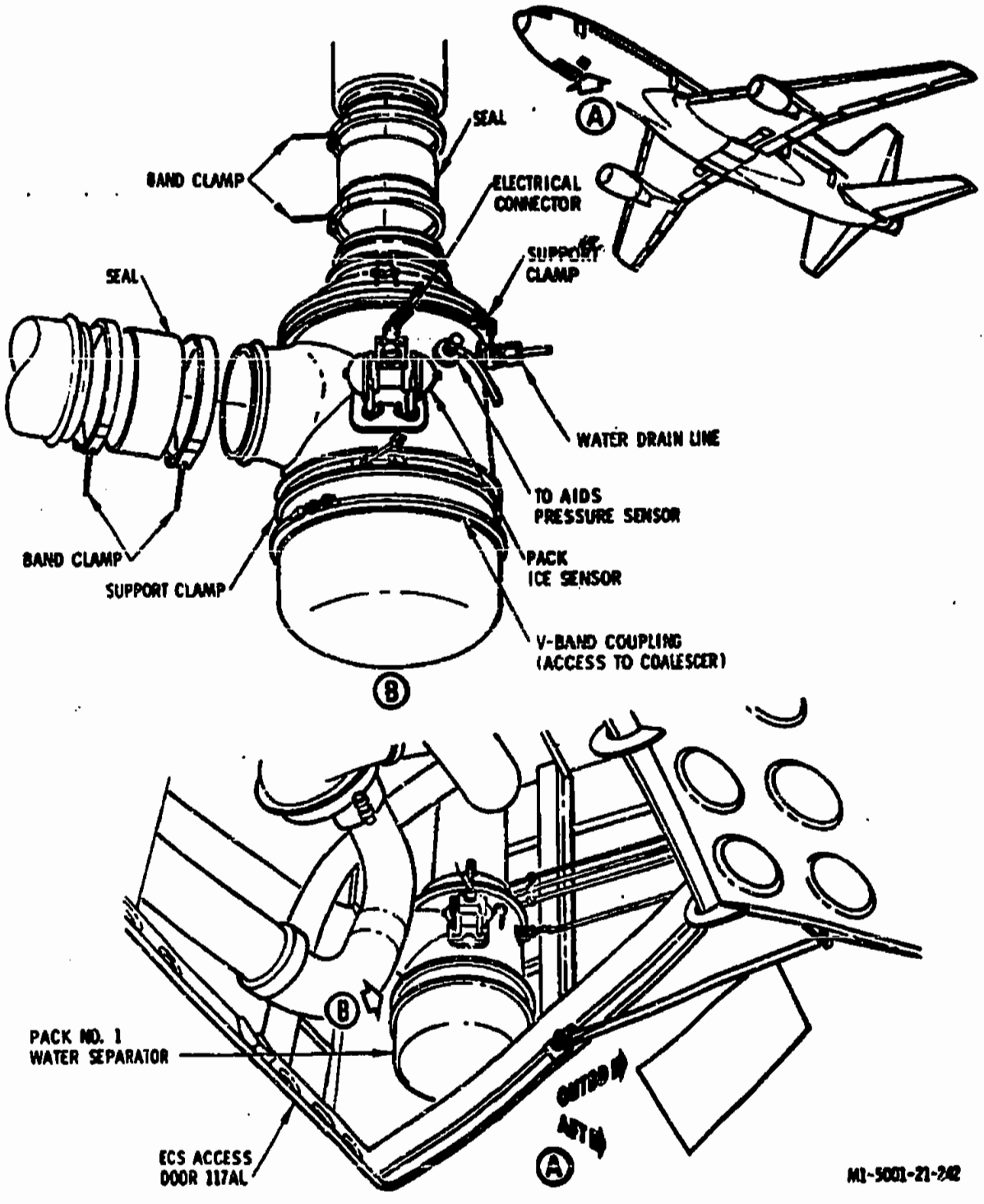
(3) Remove seals and band clamps from inlet and discharge ducts. Wipe duct ends clean and inspect for damage. Replace or repair as necessary.

(4) Wipe clamps and seals clean and inspect for damage or deterioration. Replace any damaged or deteriorated component.

(5) Install two band clamps, followed by seal, fully onto water separator inlet and discharge ducts.

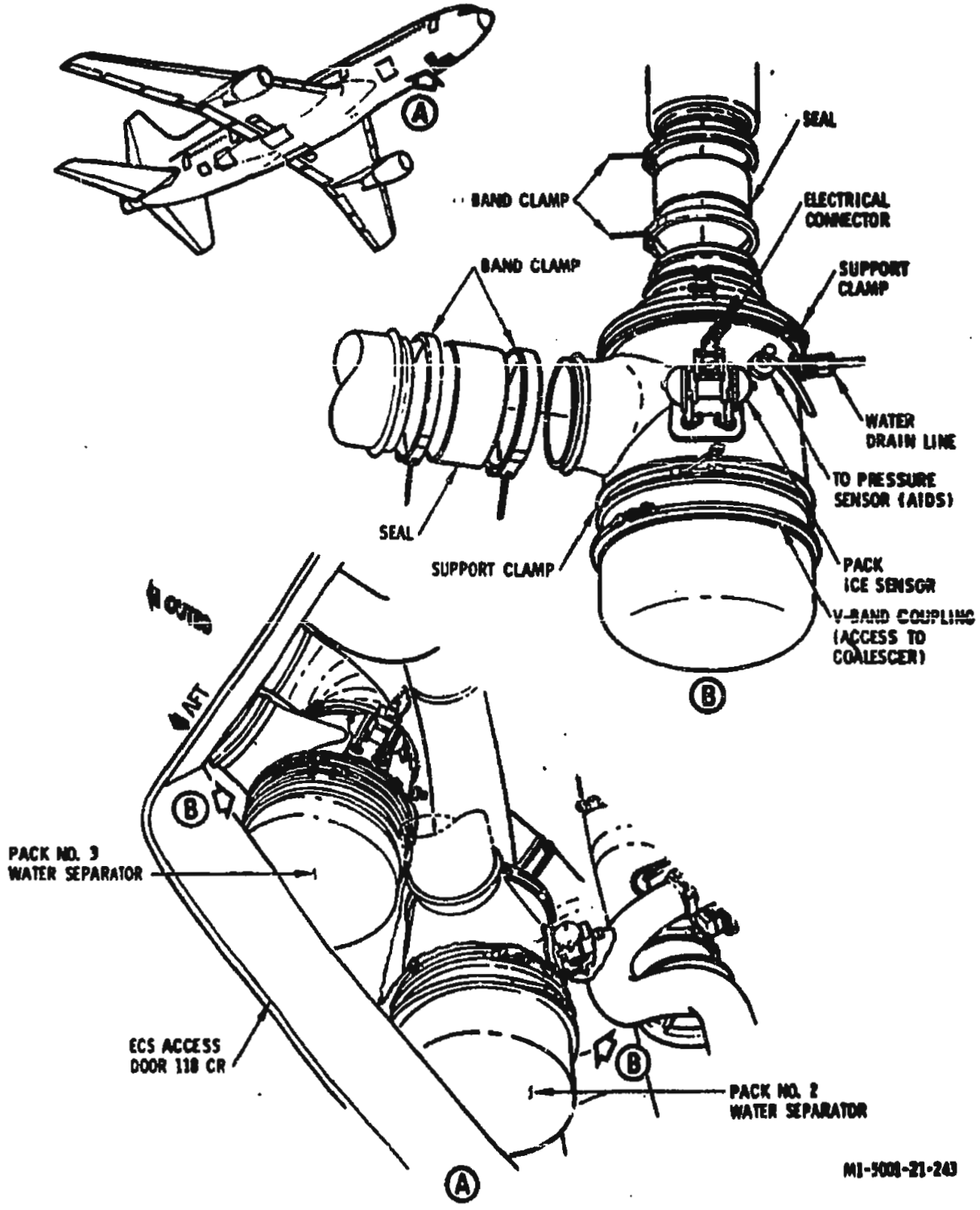
(6) Remove protective shipping covers from water separator and inspect separator for damage, particularly pack ice sensor mounting surface and sensor ports. Reject if damaged.

(7) Install new O-ring on water drain line fitting and install fitting and O-ring in water separator water drain port (Ref. Fig. 401).



R Water Separator - Removal and Installation
R Figure 401 (Sheet 1)

EFFECTIVITY: ALL



R Water Separator - Removal and Installation
R Figure 401 (Sheet 2)

EFFECTIVITY: ALL

(8) Wipe mounting surface of pack ice sensor and inspect packings around sensing ports in pack ice sensor. If packings are damaged, replace pack ice sensor.

(9) Install pack ice sensor on water separator.

(10) Install new gaskets (2) on AIDS sensor line fitting and install fitting with gaskets in water separator port. Verify cap is properly installed on water separator discharge pressure sensing fitting.

(11) Raise water separator into mounting position and connect support clamps attaching water separator to support structure.

(12) Position water separator for best alignment with inlet and discharge ducts and torque support band clamps 20 to 25 lb in.

(13) Slide seal from discharge duct down onto water separator fitting, positioning so duct and fitting ends are close together under center of seal.

(14) Move two band clamps down into position on seal, one on each side of joint and centered between fitting or duct end bulb and end of seal. Torque band clamps 50 to 60 lb in.

(15) Slide seal from inlet duct over onto water separator fitting, positioning so duct and fitting ends are close together under center of seal.

(16) Move two band clamps over into position on seal, one on each side of joint and centered between fitting or duct end bulb and end of seal. Torque band clamps 50 to 60 lb in.

(17) Remove protective plug and connect water drain line to water drain fitting.

(18) Remove protective caps and connect electrical cable connector to pack ice sensor receptacle.

(19) Remove protective plug and connect AIDS pressure sensor line to water separator fitting.

R (20) Remove WARNING tags installed inStep 4A.

(21) Remove tags and close circuit breakers opened in Step 4A(1).

(22) Turn on air conditioning system (Ref. 21-00-00).

(23) Operate air conditioning system and check water separator installation for leaks and pack ice sensor for operation.

(24) Turn off air conditioning system (Ref. 21-00-00).

(25) Close ECS compartment access door.

WATER ASPIRATOR - REMOVAL AND INSTALLATION

1. General

The water aspirators are located on the ram cooling headers. The No. 1 aspirator is on the aft outboard side of the header in zone 115. Access to the No. 1 aspirator is through heat exchanger panel 115AL (Ref. 401).

The No. 2 and No. 3 aspirators are on the aft inboard side of the respective header in Zone 116. Access to the No. 2 aspirator is through panel 116AR. Access to the No. 3 aspirator
R is through panel 116BR.

R On aircraft with SB21-034,
R the water aspirators have been deactivated by capping the water
R line at the water separator.

2. Equipment and Materials

Protective caps

3. Removal/Installation

A. Removal

WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Remove the applicable heat exchanger access panel 115AL, 116AR, or 116BR.

(2) Disconnect and cap the water and air tubes at the aspirator.

(3) Loosen nut on aspirator at ram cooling header connection.

(4) Remove and cap the aspirator from the ram cooling header.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Remove caps from the aspirator and ram cooling header tube connections.

(2) Install aspirator into ram cooling header connection.

(3) Tighten nut on aspirator at ram cooling header connection.

C NOTE: Water line (Flex with quick disconnect) is
C connected to center port of aspirator.

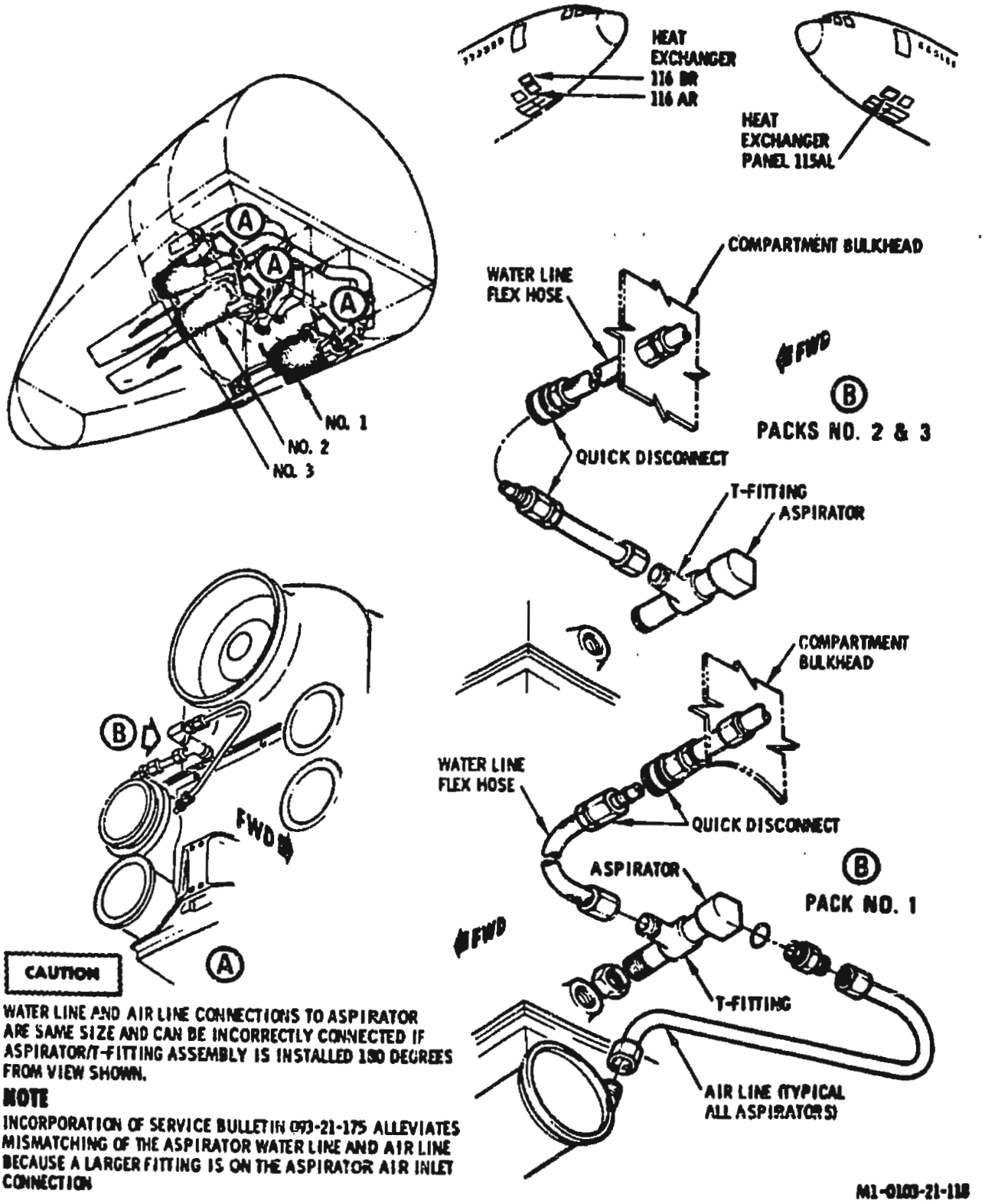
CAUTION: WATER LINE AND AIR LINE CONNECTIONS TO ASPIRATOR ARE SAME SIZE AND CAN BE INCORRECTLY CONNECTED IF ASPIRATOR/T-FITTING ASSEMBLY IS INSTALLED 180 DEGREES FROM VIEW SHOWN IN FIGURE 401.

NOTE: Incorporation of service bulletin 093-21-175 alleviates mismatching of the aspirator water line and air line because a larger fitting is on the aspirator air inlet connection.

(4) Install the water and air tubes to the aspirator.

(5) Install heat exchanger access panel.

(6) Remove placards installed at beginning of Paragraph 3.



CAUTION

WATER LINE AND AIR LINE CONNECTIONS TO ASPIRATOR ARE SAME SIZE AND CAN BE INCORRECTLY CONNECTED IF ASPIRATOR/T-FITTING ASSEMBLY IS INSTALLED 180 DEGREES FROM VIEW SHOWN.

NOTE

INCORPORATION OF SERVICE BULLETIN 093-21-175 ALLEVIATES MISMATCHING OF THE ASPIRATOR WATER LINE AND AIR LINE BECAUSE A LARGER FITTING IS ON THE ASPIRATOR AIR INLET CONNECTION

M1-0100-21-118

R
R

Water Aspirator - Removal and Installation
Figure 401

EFFECTIVITY: ALL

001B

WATER ASPIRATOR - CLEANING AND PAINTING

1. General

The water aspirators are located on the ram cooling headers. The No. 1 aspirator is on the aft outboard side of the header in zone 115. Access to the No. 1 aspirator is through heat exchanger panel 115AL (Ref. Fig. 401).

The No. 2 and No. 3 aspirators are on the aft inboard side of their respective headers in zone 116. Access to the No. 2 aspirator is through panel 116AR. Access to the No. 3 aspirator is through panel 116BR.

2. Equipment and Materials

Petroleum Solvent, AMS 3160B, or equivalent

3. Referenced Procedure

21-51-25 Water Aspirator - Removal and Installation

4. Cleaning/Painting

A. Cleaning

(1) Remove water aspirator from ram cooling header (Ref. 21-51-25).

R WARNING: AVOID PROLONGED INHALATION OF SOLVENT FUMES AND AVOID PROLONGED SKIN CONTACT WITH SOLVENT.

(2) Clean aspirator by dipping, swabbing, or spraying with solvent AMS 3160B. If deposits do not readily wash off, the aspirator may be scrubbed with a natural bristle brush.

R CAUTION: DO NOT USE METAL WOOL, METAL BRUSHES OR ABRASIVES TO CLEAN ASPIRATOR.

(3) Clear aspirator passages and dry aspirator using clean dry filtered compressed air.

(4) Visually inspect aspirator for galling, nicks, scratches, burrs, or other damage. These conditions are allowable only to the extent that the aspirators

R R function is not impaired in any way, or that no leakage exists or could develop.

R R R (5) Check all threads for irregularities. Check surface treatment for damage exposing base metal. A cracked, chipped or deformed aspirator must be replaced.

R R (6) Check all passages to verify they are clear of obstructions. No obstructions are allowed.

R R (7) Install water aspirator in ram cooling header (Ref. 21-51-25).

AIR CYCLE MACHINE INLET SHELL - REMOVAL AND INSTALLATION

1. General

The air cycle machine (ACM) must be removed before removal of the ACM inlet shell. The ACM inlet shell must be installed before installing the ACM.

The inlet shell for pack No. 1 is in zone 117. Access is through environmental control system (ECS) door 117AL (Ref. Fig. 401). The inlet shells for packs No. 2 and No. 3 are in zone 118. Access is through ECS compartment door 118CR.

The ACM inlet shells are removed or installed by following the procedure for the ACM (Ref. 21-51-07). Use the following procedure in addition to the referenced procedure to remove or install the inlet shell.

2. Equipment and Materials

Preformed Packing, Hamilton Standard PN 69494J461, or equivalent (2 req)

3. Referenced Procedure

21-51-07 Air Cycle Machine - Removal and Installation

4. Removal/Installation

A. Removal

(1) Perform all removal steps as specified in 21-51-07.

(2) Slide inlet shell aft until clear of bellmouth inlet.

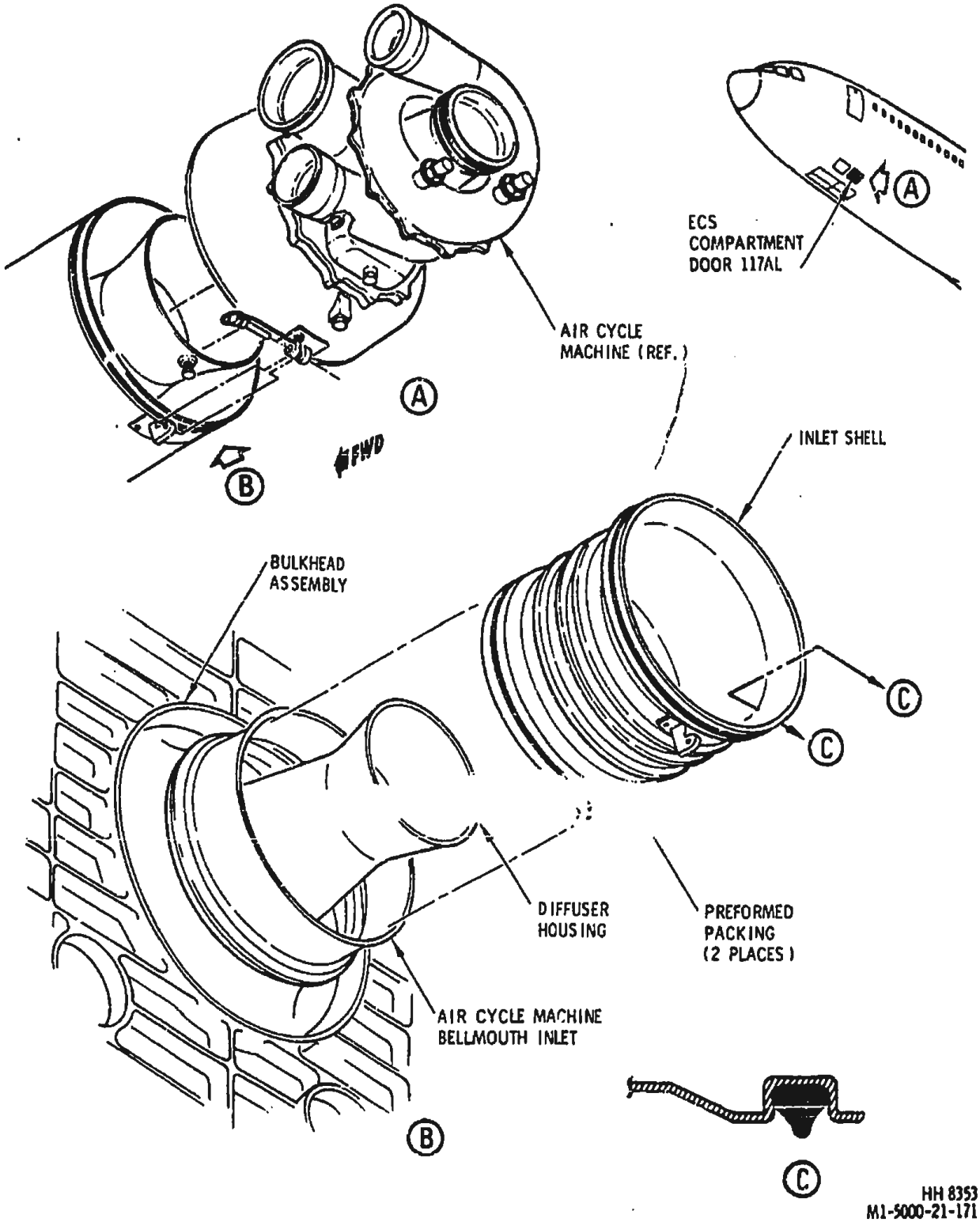
(3) Remove inlet shell from the aircraft.

(4) Remove and discard preformed packings on exterior of the inlet shell.

B. Installation

(1) Install new preformed packings in grooves on exterior of the inlet shell.

(2) Slide inlet shell into aft end of bellmouth inlet.



Air Cycle Machine Inlet Shell - Removal and Installation
Figure 401

(3) Perform all installation steps as specified in 21-51-07.

AIR CYCLE MACHINE DIFFUSER HOUSING - REMOVAL AND INSTALLATION

1. General

The air cycle machine (ACM) must be removed before removal of the ACM diffuser housing. The ACM diffuser housing must be installed before installing the ACM.

The diffuser housing for pack No. 1 is in zone 117. Access is through environmental control system (ECS) door 117AL (Ref. Fig. 401). The diffuser housings for packs No. 2 and No. 3 are in zone 118. Access is through ECS compartment door 118CR.

The ACM diffuser housing is removed or installed by following the procedure for the ACM (Ref. 21-51-07). Use the following procedure in addition to the referenced procedure to remove or install the diffuser housing.

2. Equipment and Materials

Preformed Packing, Hamilton Standard PN 69494J273, or equivalent

3. Referenced Procedure

21-51-07 Air Cycle Machine - Removal and Installation

4. Removal/Installation

A. Removal

(1) Perform all removal steps as specified in 21-51-07.

(2) Remove diffuser housing from the ram cooling header through aft end of header.

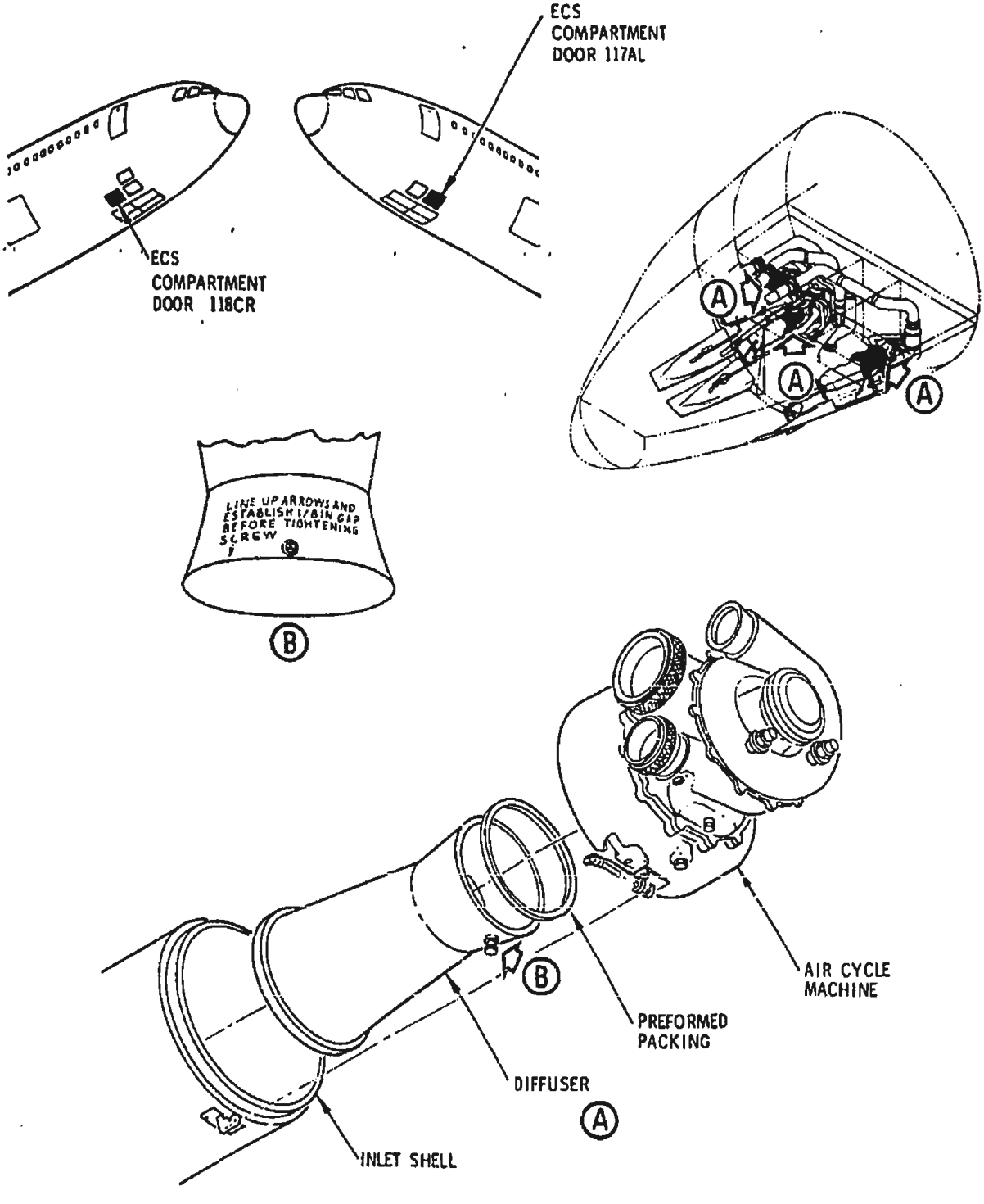
(3) Remove diffuser housing from the aircraft.

(4) Remove and discard preformed packing from the diffuser housing at the small diameter end.

B. Installation

(1) Install a new preformed packing in groove of diffuser housing at the small diameter end.

(2) Install diffuser housing into the ram cooling header through aft end of header.



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M1-5000-21-177

Air Cycle Machine Diffuser Housing
Removal and Installation
Figure 401

(3) Perform all installation steps as specified in 21-51-07.

WATER SEPARATOR COALESCER - REMOVAL AND INSTALLATION

1. General

Removal and installation of the three water separator coalescers is identical except for access.

The No. 1 water separator is in zone 117, and access is through environmental control system (ECS) compartment door 117AL. The No. 2 and No. 3 water separators are in zone 118, with access through ECS compartment door 118CR.

2. Equipment and Materials

R Coalescer, Water Separator, Hamilton Standard PN 740599-9, or
R equivalent

R Preformed packing, Hamilton Standard PN 720752-41, or equivalent

Draw String, NO. 1194, or equivalent Gudebrod Bros. Silk Company (07896), Burbank, Calif.

R 3. Referenced Procedures

R 21-00-00 Air Conditioning System - Maintenance Procedures

R 4. Removal/Installation

A. Removal

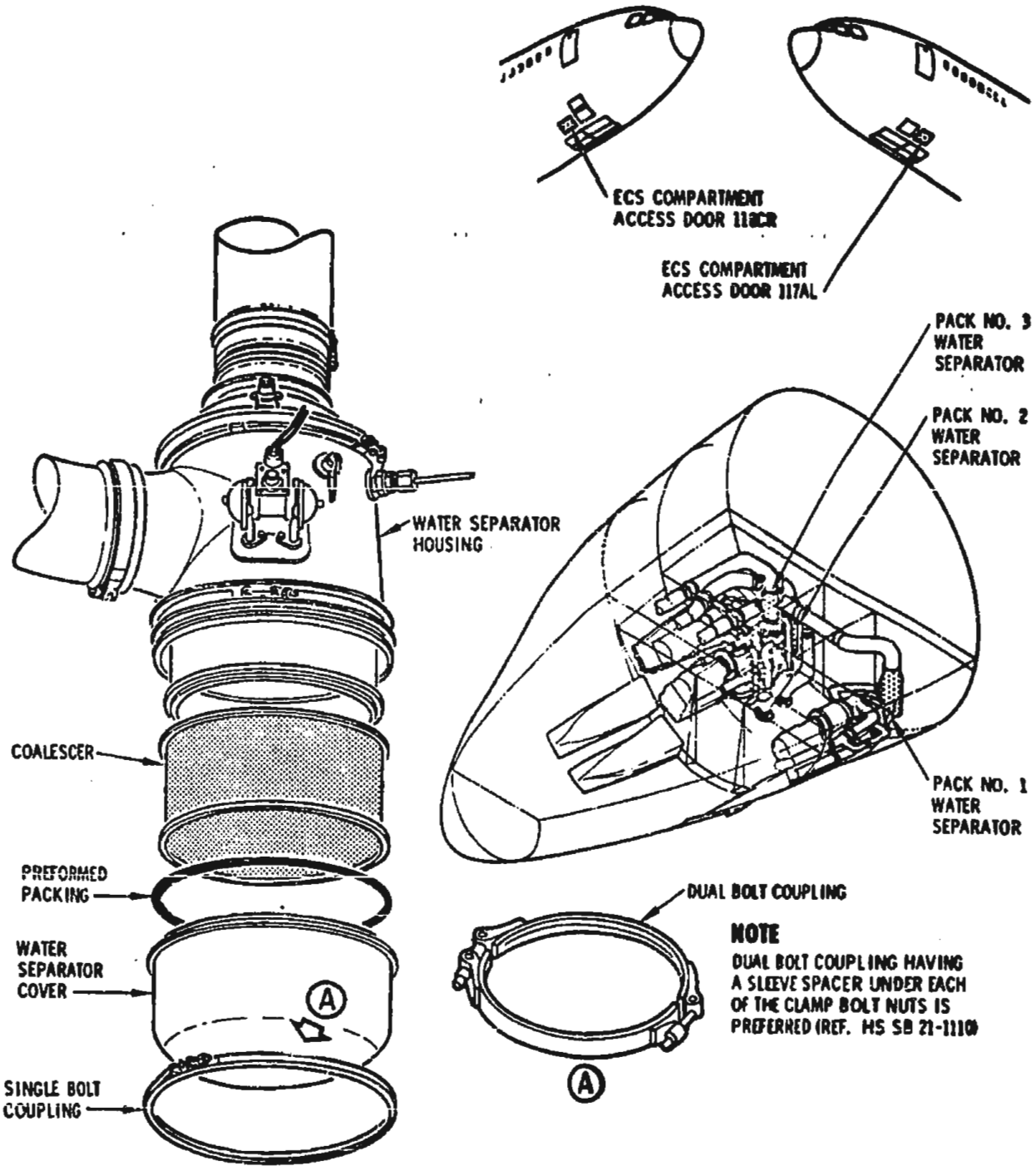
WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) Open applicable ECS compartment door 117AL or 118CR (Ref. Fig. 401).

R (2) Loosen coupling at water separator cover.

R NOTE: Coalescer covers may be attached to water
R separator housings by either a single band,


ECS COMPARTMENT ACCESS DOOR 118CR
ECS COMPARTMENT ACCESS DOOR 117AL
PACK NO. 3 WATER SEPARATOR
PACK NO. 2 WATER SEPARATOR
PACK NO. 1 WATER SEPARATOR
WATER SEPARATOR HOUSING
COALESCER
PREFORMED PACKING
WATER SEPARATOR COVER
SINGLE BOLT COUPLING
DUAL BOLT COUPLING
A
NOTE
DUAL BOLT COUPLING HAVING A SLEEVE SPACER UNDER EACH OF THE CLAMP BOLT NUTS IS PREFERRED (REF. HS SB 21-1110)
M1-0104-21-094

R Water Separator Coalescer - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

R single bolt coupling or by a preferred two
R section, dual bolt coupling. When removing a
R dual coupling, the two coupling bolt nuts must
R be loosened alternately and evenly.

R (3) Remove coupling and separate cover from water separator
R housing.

R (4) Remove and discard preformed packing at cover support
R flange.

(5) Remove lock-wire from around top of coalescer (if installed).

R (6) Loosen coalescer draw string (if installed) and remove
R coalescer.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

R NOTE: P/N 740599-6 and -9 coalescers are identical except
R for a larger and stronger elastic band used in the -9
R coalescer. The installation of coalescer retention
R draw strings is added assurance that the coalescer
R will not slip out of its properly installed position,
R especially in the earlier -6 installations.

R If the coalescer does not have draw strings, install
R strings in each eleastic band pocket as follows:

R Through a small hole, thread the draw string through
R the elastic band pocket and back out of the hole.

R NOTE: The coalescer cloth must uniformly cover the lower
R area of the water separator inner housing with the
R elastic bands positioned over the top and bottom
R ridges of the coalescer support screen.

R (1) Install coalescer on the water separator screen with
R the "fuzzy" or nap side facing inward against the
R screen (for better adhesion to screen mesh). Tighten
R and tie draw strings after the coalescer bag is
R properly installed over the entire screen mesh surface.
R Do not use lockwire.

R (2) Install new preformed packing in the water separator
R cover flange.

R R (3) Attach water separator cover to housing using grooved coupling.

R CAUTION: DO NOT OVERTORQUE GROOVED COUPLING.

R R R R R R R R R R R NOTE: Tighten single bolt coupling nut 25 to 35 lb.in. higher than the torque required to turn the nut. Lightly tap the coupling band at three places, approximately 120 degrees apart and tighten again to specified torque. Repeat torqueing sequence twice. If a dual bolt doupling is installed, alternately and evenly, tighten each of the coupling bolt nuts 30 to 40 lb.in. higher than the torque required to turn the nut. Lightly tap the coupling bands and apply specified torque two more times as, noted above.

R (4) Tighten coupling bolt nuts as noted in preceeding note.

R R R (5) While operating ECS pack in the system having the replaced coalescer, check the coalescer cover flange for signs of leakage (Ref. 21-00-00).

R (6) Close ECS compartment door.

R (7) Remove WARNING placards installed in Step 4A.

WATER SEPARATOR COALESCER - CLEANING

1. General

One coalescer bag is installed in each of the three water separators. Cleaning of the three water separator coalescers is identical.

The No. 1 water separator is in zone 117, and access is through environmental control system (ECS) compartment door 117 AL. The No. 2 and No. 3 water separators are in zone 118, with access through ECS compartment door 118 CR.

2. Equipment and Materials

Basic I Liquid Cleaner - Shaklee Products 2035 National Avenue, Hayward Calif. 94545.

3. Cleaning

(1) Wash the coalescer using a solution of water heated to 100 to 130°F (38 to 54°C) and Basic I cleaning solvent mixed at a ratio of 2 fluid ounces of cleaning solvent to 1.0 gallons of water.

(2) Soak the coalescer in the solution for approximately 15 minutes.

(3) Rinse coalescer in a clean solution of Basic I and water by dipping in and out of the solution approximately 20 to 30 times to flush away loose dirt.

R CAUTION: DO NOT TWIST OR RUB COALESCER AS THIS WILL CAUSE THE NAP TO "BALL" OR "PILL".

(4) Rinse a second time, in clean warm water and press excess water out after rinsing.

(5) Repeat the rinse described in Step (4).

(6) Hang the coalescer to dry at room temperature. Coalescer may be drip dried or water may be pressed out prior to drying.

COLD AIR PLENUM - REMOVAL AND INSTALLATION

1. General

The cold air plenum is located under the cabin floor boards near the forward right passenger door R1, zone 119, between FS 328 and FS 369. Access is through the floor boards. Parts of the plenum can be visually inspected from the FESC when looking toward the aft bulkhead.

2. Referenced Procedures

6-50-00	Internal Access Doors and Panels - Removal and Installation
29-11-00	Hydraulic Power Systems - Maintenance Practices
53-22-00	Cabin Floor Panels - Removal and Installation

3. Removal/Installation

A. Removal (Ref. Fig. 401)

R WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

VERIFY ALL HYDRAULIC SYSTEMS ARE OFF BEFORE WORKING AROUND COLD AIR PLENUM (REF. 29-11-00). PLACARD FLIGHT ENGINEER/SECOND OFFICERS HYDRAULIC SYSTEM PANEL, ZONE 215, AND HYDRAULIC SERVICE PANEL, ZONE 147. HYDRAULIC POWER IS SHUT OFF TO PREVENT ACCIDENTAL MOVEMENT OF FLIGHT CONTROL CABLES PASSING ABOVE PLENUM. CABLE MOVEMENT WITH PNEUMATIC POWER ON CAN CAUSE MOVEMENTS IN THE SPOILERS, AILERONS, ELEVATORS OR VERTICAL STABILIZER THAT MAY BE HAZARDOUS TO ANYONE WORKING IN THOSE AREAS.

(1) In passenger compartment between R-1 door and centerline of aircraft remove internal access panels

(floorboards) shown in Figure 401 (Ref. 6-50-00 and 53-22-00).

(2) Locate FESC exhaust ducting below door R-1.

R (3) Disconnect coupling connecting Y-duct with FESC exhaust duct at FS 328 by removing eight nuts and bolts.

R (4) Remove band clamps and hose connecting Y-duct and cylindrical duct near door.

(5) Remove ducting tape securing both ends of flat angled duct.

(6) Remove two band clamps and hose from around coupling on cylindrical duct at FS 369.

(7) Loosen band clamp around cylindrical duct at FS 349.

(8) Remove ducts by pulling Y-duct toward door and then up. Then remove angled duct and cylindrical duct.

(9) Remove plenum cover and gaskets. Pull cover through opening near door to avoid flight control cables.

(10) Disconnect three plenum intake ducts from plenum chamber. Remove gaskets.

(11) Disconnect all outlet ducts from plenum chamber. Remove gaskets.

(12) Disconnect water drain lines from plenum.

(13) Remove screws connecting right half and left half of plenum chamber. Remove gaskets.

(14) Remove right and left halves of plenum chamber through opening near R-1 door.

B. Installation (Ref. Fig. 401)

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Install right and left halves of plenum in proper position under floor through opening near R-1 door.

(2) Replace gasket and connect right half of plenum chamber to left half with screws.

(3) Connect water drain lines to plenum.

(4) Replace gaskets and reconnect outlet ducts to plenum.

(5) Replace gaskets and reconnect intake ducts to plenum.

(6) Replace gaskets and install cover on plenum.

(7) Place cylindrical duct in position with band clamps and hose loosely in position.

(8) Place flat angled duct in position.

R (9) Place Y-duct in position with band clamps and hose loosely in position.

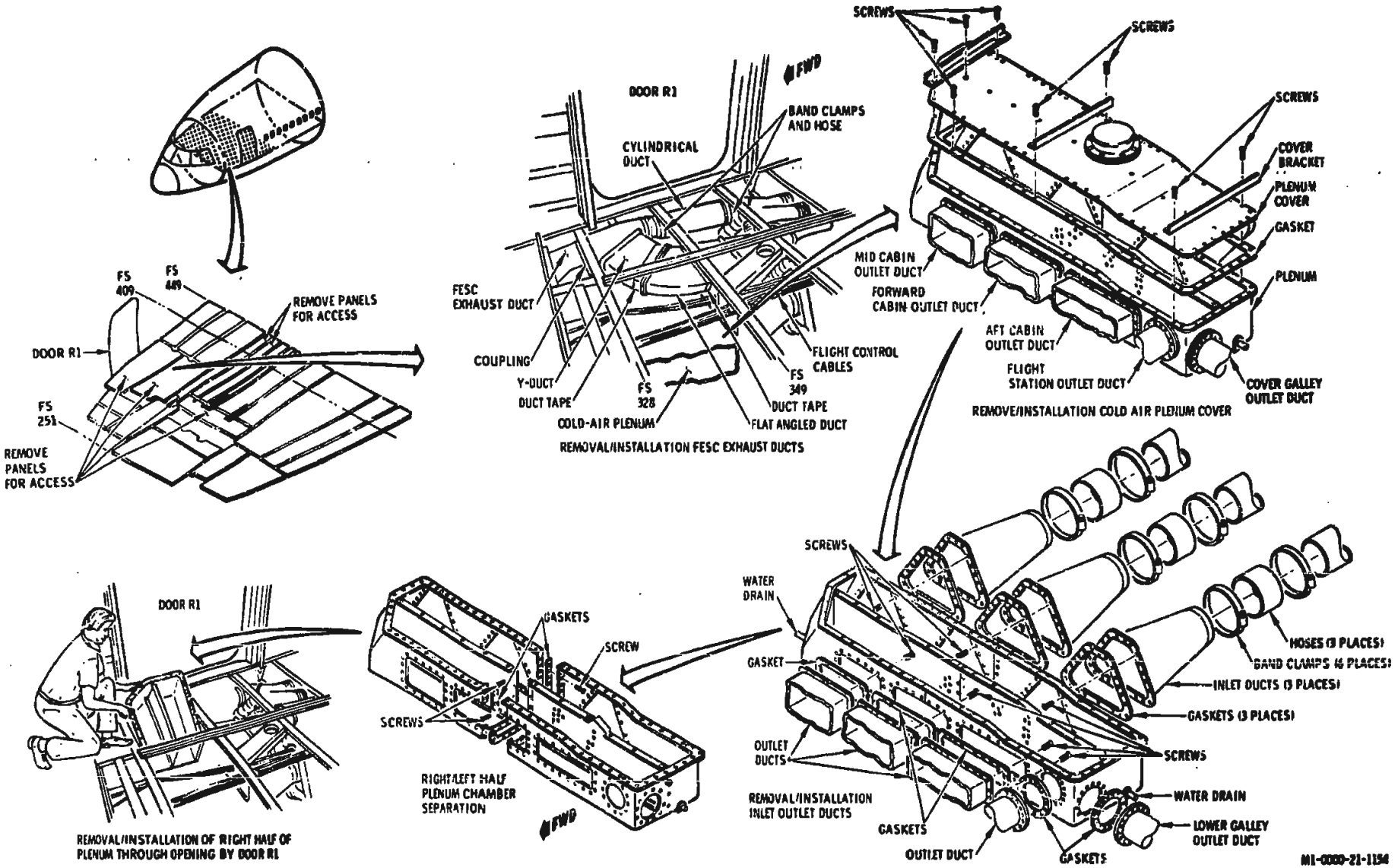
R (10) Secure all band clamps and hose connections on Y-duct and cylindrical duct. Secure band clamp at FS 349.

(11) Secure coupling at FS 328.

(12) Tape with ducting tape to seal both ends of flat angled duct.

(13) Replace floor boards.

(14) Remove placards on hydraulic service panel, hydraulic system panel, APU control panels and three high-pressure ground air connections.



R R Cold Air Plenum - Removal and Installation
Figure 401

R EFFECTIVITY: ALL
R
001B

TEMPERATURE CONTROL - DESCRIPTION AND OPERATION

1. General

Portions of the air conditioning system included in the temperature control system are the zone trim control system, the air cycle pack control system, the indicating and monitoring system, and the built-in system test equipment.

The zone trim control system (Ref. 21-61-00) provides individual selective control of air temperatures in each of five temperature control zones. Five temperature selectors at the bottom of the Flight Engineer/Second Officers CABIN TEMP CONTROL panel provide selections for temperatures between 65 and 85 degrees F in the flight station, forward cabin, mid cabin, aft cabin, and galley.

Hot air for the zone trim control system is taken from the hot air manifold system (Ref. 21-41-00) through a pressure regulator valve and delivered to a manifold supplying the independent zone trim control subsystems. Major components in each of the zone trim control subsystems are a selector, a zone temperature controller, a zone trim control valve, a duct temperature sensor, and a zone temperature sensor.

The air cycle pack control system (Ref. 21-62-00) provides temperature control of pack discharge air from the three independent air cycle packs (Ref. 21-51-00).

Pack No. 1 discharge temperatures are controlled to the lowest temperature needed by the flight station or galley and packs No. 2 and 3 to the lowest needed by any of the three cabin zones.

Discharge air from all three packs is combined in the cold air plenum. Individual zone supply air temperature control is achieved when a zone trim control subsystem adds a "trim" quantity of hot air from the hot air manifold to air from the cold air plenum going to each zone.

Major components in each of the three air cycle pack control systems are a pack temperature controller, a ram cooling air
R control (actuator and exhaust valve), a turbine bypass valve,
R and a pack discharge temperature sensor.

R On aircraft 001-031 without SB21-115,
R each of the three air cycle pack control systems also contains a
R water separator ice sensor.

The indicating and monitoring system (Ref. 21-63-00) provides operational information from those points in the air

conditioning system that allow system performance to be analyzed. Selectors and indicators on the Flight Engineer/Second Officers ECS MONITOR panel are used to determine:

The quantity of airflow through each air cycle pack

The air temperatures at five different points in each air cycle pack system

Both supply and occupied areas air temperatures in the temperature control zones.

The built-in system test equipment (Ref. 21-64-00) consists of the temperature control system test module and interconnections to temperature control system control components. The test module located in the forward electronic compartment provides selectors and go, no-go indicators for rapid on-ground isolation of system malfunction.

R With the air conditioning system not operational as selected on
R the Flight Engineer/Second Officers CABIN TEMP CONTROL panel,
R the test module may be used to conduct a complete temperature
R control system checkout without leaving the forward electronic compartment and without communication with the flight station.

Fault isolation can be performed without unloading passengers. Self-test capability is included in the test module; a malfunction in the test circuitry will not affect the operation or reliability of the temperature control system.

R TEMPERATURE CONTROL - FAULT ISOLATION

R 1. General

R The Temperature Control System is divided into four subsystems: the Zone Trim Control System (Ref. 21-61-00), the Air Cycle Pack Control System (Ref. 21-62-00), the Indicating and Monitoring System (Ref. 21-63-00), and the Built-in System Test (Ref. 21-63-00).

R Fault isolation procedures for these systems are provided in the corresponding fault isolation section.

R Fault isolation for the dehumidification system is provided in 21-62-00, Fault Isolation.

R Reference data and fault isolation procedures for troubleshooting the temperature control system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FRM fault code number. This number and the flight log book write-up can be found in the Chapter 21 Fault Code Index. The index specified the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the entry point containing the fault isolation procedure. When no block number is specified, the entry point is block 1.

R PREREQUISITES listed at the top of each fault isolation diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Temperature Control System. It gives the access/area of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed
R discussion of the Fault Isolation Reporting Method (FIRM) and
R use of fault isolation diagrams/schematics.

R 2. Fault Isolation Identification

R Table 101 is a list of fault isolation data in this section of
R the manual.

R TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
SCHEM 1 Zone/Pack	Temperature Controller Interconnection Schematic

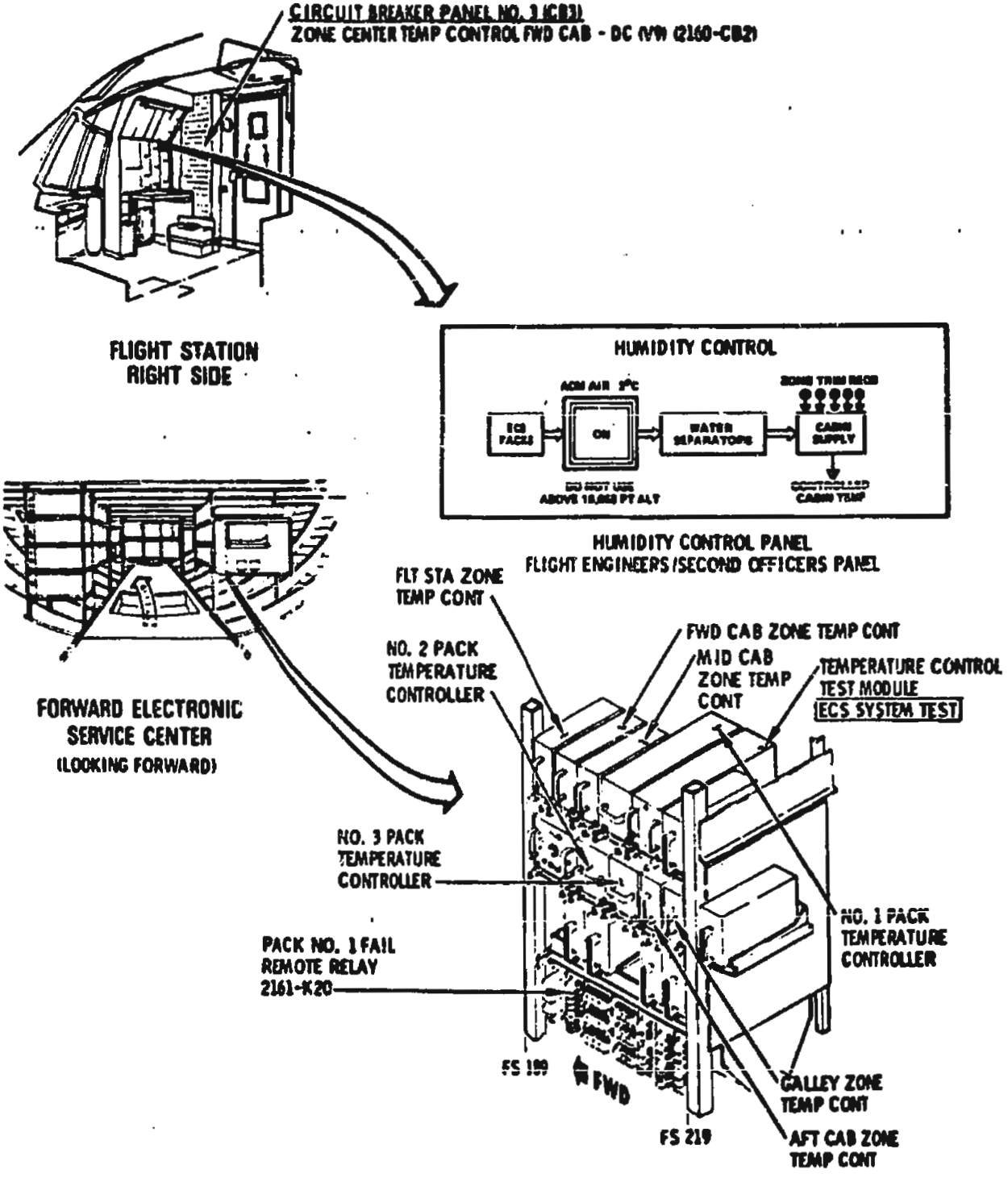
COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKER			
ZONE CENTER TEMPERATURE CONTROL FWD CAB - DC (2160-CB2)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V9); 215	•
PACK TEMPERATURE CONTROLLERS			
NO. 1	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
NO. 2	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
NO. 3	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
PANEL – HUMIDITY CONTROL	1	FE/SO LOWER PANEL; 215	•
RELAY			
PACK NO. 1 FAIL REMOTE (2161-K20)	1	FESC, RELAY PANEL BELOW RIGHT ELECTRICAL RACK; 112AB	•
TEMPERATURE CONTROLLERS			
AFT CABIN – ZONE 4	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
FLIGHT STATION – ZONE 1	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
FORWARD CABIN – ZONE 2	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
GALLEY – ZONE 5	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•
MID CABIN – ZONE 3	1	FESC, RIGHT ELECTRICAL RACK; 112AB	•

*SEE WM EQUIPMENT LIST

M1-0000-21-1286

R R Temperature Control System Component Location Index
Figure 101

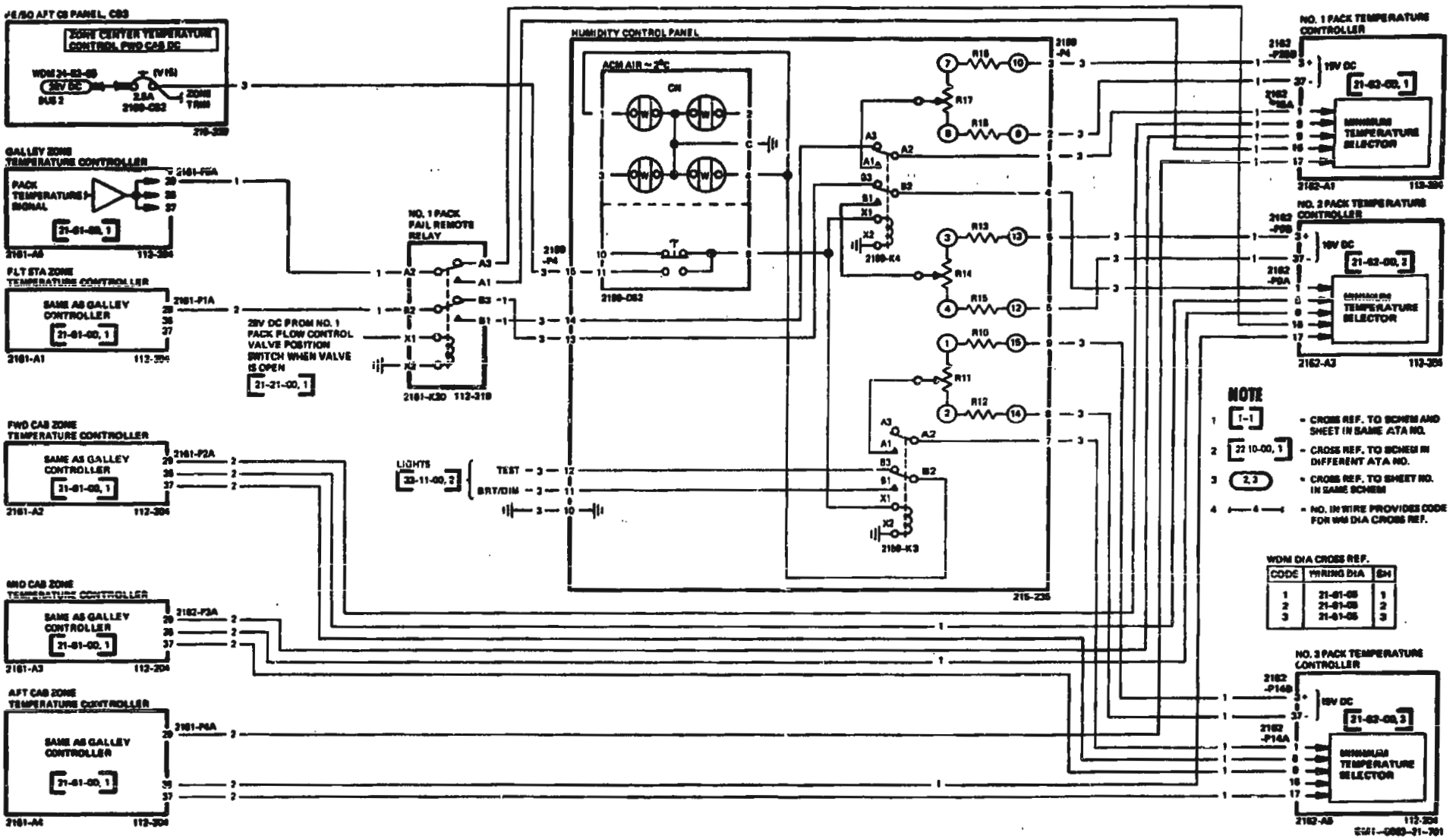
R R 001B EFFECTIVITY: ALL



RIGHT SIDE ELECTRONIC RACK EQUIPMENT

M1-0001-21-1289

R Temperature Control System Component Locator Diagram
R Figure 102


HUMIDITY CONTROL PANEL
NO. 1 PACK TEMPERATURE CONTROLLER
NO. 2 PACK TEMPERATURE CONTROLLER
NO. 3 PACK TEMPERATURE CONTROLLER
GALLEY ZONE TEMPERATURE CONTROLLER
FLT STA ZONE TEMPERATURE CONTROLLER
FWD CAB ZONE TEMPERATURE CONTROLLER
MID CAB ZONE TEMPERATURE CONTROLLER
AFT CAB ZONE TEMPERATURE CONTROLLER
NO. 1 PACK FAIL REMOTE RELAY
28V DC FROM NO. 1 PACK FLOW CONTROL VALVE POSITION SWITCH WHEN VALVE IS OPEN
LIGHTS
TEST
BRT/DIM
MINIMUM TEMPERATURE SELECTOR
TEMPERATURE SELECTOR
NOTE
1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22 10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 [2,3] - CROSS REF. TO SHEET NO. IN SAME SCHEM
4 - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
WDM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 21-61-05 | 1
2 | 21-61-05 | 2
3 | 21-61-05 | 3

R Zone/Pack Temperature Controllers Interconnection Schematic
R SCHEM 1

EFFECTIVITY: ALL

001B

TEMPERATURE CONTROL - ADJUSTMENT AND TEST

R 1. General

The Temperature Control System is tested using built-in test equipment (BITE). The Temperature Control Test Module (TCTM) can be switched to test any one of the Air Cycle Zone Trim Control Systems (Ref. 21-61-00), any of the three Air Cycle Pack Control Systems (Ref. 21-62-00) or the TCTM itself (Ref. 21-64-00).

The TCTM is mounted in the electrical rack in the forward electronic service center (FESC), zone 112 (Ref. Fig. 501).

The selector switches S1 and S2 on the front of the TCTM determine the sub-system and individual component respectively to be tested.

Flip charts on the inside of the TCTM front cover give operating instructions and list components under test for all selector switch positions.

When doing a test, an amount of time will elapse after the PUSH TO TEST switch is depressed before the go or no-go indication will come on. This time depends on the test selector positions (Ref. Table 501).

R Perform BITE procedures only when a system or subsystem is not on. The test method is a complete test of the system, with the temperature control system off. If a Fault is suspected in only a specific subsystem, turn off the subsystem and leave the rest of the temperature control system operating. Then do only the portion of the BITE procedure pertinent to the suspected subsystem.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Adjustment/Test

A. BITE Test

(1) On pilots overhead circuit breaker panel CB1, zone 210, verify the following circuit breakers are closed:

ENVIR CONTROL SYSTEM

PACK - FLOW CONTROL - 1 (H3)

PACK - FLOW CONTROL - 2 (H4)

PACK - FLOW CONTROL - 3 (H5)

(2) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, verify the following circuit breakers are closed:

PACK 1 - AUTO/MAN - DC (V5)

PACK 1 - AUTO/MAN - AC (V6)

PACK 2 - AUTO/MAN - DC (V7)

PACK 2 - AUTO/MAN - AC (V8)

PACK 3 - AUTO/MAN - DC (V17)

PACK 3 - AUTO/MAN - AC (V18)

TEMP CONT - FLT STA - DC (V3)

TEMP CONT - FLT STA - AC (V4)

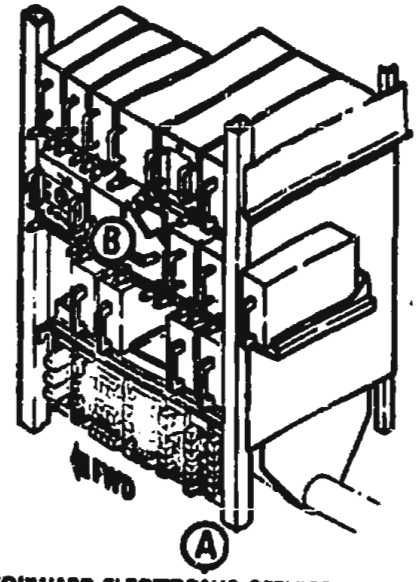
BITE RESPONSE TIMES TABLE 501

S-1 POSITION	S-2 POSITION																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TCTM	S	M	M	L	M	S	M	S	M	S	L	S	M	S	S	S	M
FLT STA FWD CAB MID CAB AFT CAB GALLEY	S	M	M	L	M	S	M	S	M	S	L	S	M	S	S	S	M
PACK 1 PACK 2 PACK 3	S	M	M	L	M	S	M	S	M	S	L	S	M	S	S	S	M

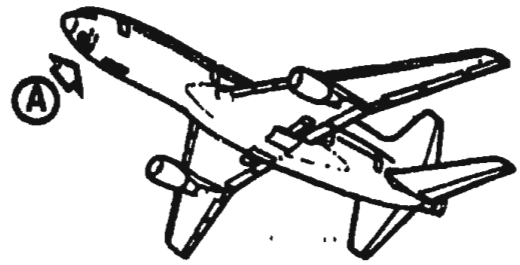
NOTE
COLUMN ENTRIES INDICATE APPROXIMATE TIME REQUIRED TO OBTAIN GO OR NO-GO TEST INDICATION FOR S-1 AND S-2 SWITCH SELECTIONS. S-SHORT, 5-SECONDS. M-MEDIUM, 25-SECONDS. L-LONG, 50 SECONDS

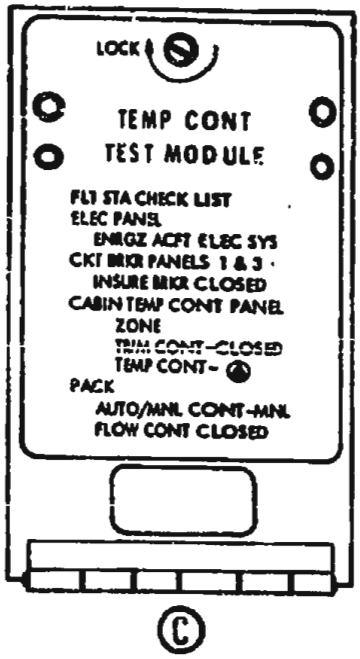
M1-0001-21-305

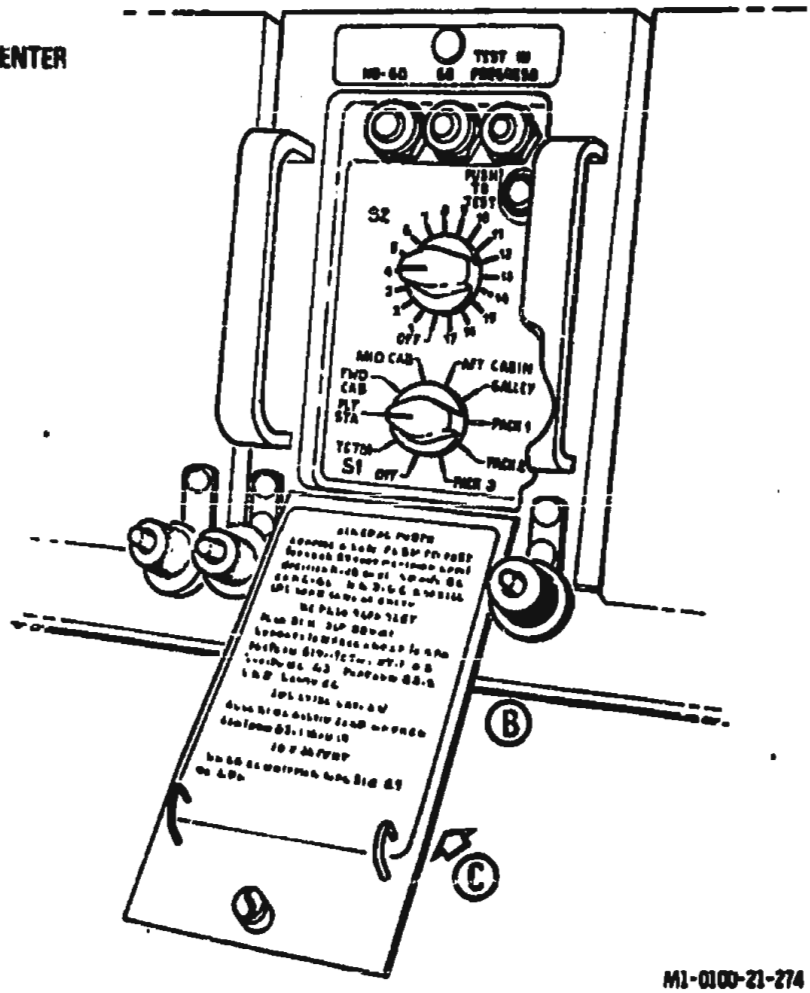
Bite Response Times
Table 501



FORWARD ELECTRONIC SERVICE CENTER
ELECTRICAL RACK







M1-0100-21-274

Temperature Control Test Module
Figure 501 (Sheet 1)

GENERAL TEST INSTR

Push & hold PUSH TO TEST for GO or NO GO light (4-60 sec). Release button. If NO GO see LRU REPLACEMENT CHART. If GO select next S2 position.

MODULE SELF TEST

Turn S1 to TCTM & S2 to -1. Push indicators to check bulbs. Verify NO GO in S2-1 & -2, and GO in S2-3 & -4.

PACK OR ZONE TEST

Turn S1 to suspect pack or zone, S2 to positions with letters on LRU REPLACEMENT CHART, and perform GENERAL TEST.

IMPORTANT

Turn S1 & S2 OFF after test

LETTER CODE FOR LRU REPLACEMENT CHART

- A - See Module Self Test
- B - TCTM
- C - If flt sta checklist verified, mail in mnl ckt
- D - Controller
- E - Zone Trim Valve
- F - Turbine Bypass Valve
- G - Zone Duct Temp Sensor
- H - Pack Discharge Temp Sensor
- I - Zone Temp Sensor
- J - Temp Selector
- K - Ram Air Actuator
- L - If flt sta checklist verified, mail in mnl ckt or flow control switch ckt
- \- No test

LRU REPLACEMENT CHART

OFF	TCTM	Flt Sta	Fwd Cab	Mid Cab	Aft Cab	Galley	Pack 1	Pack 2	Pack 3
1	A	C	C	C	C	C	L	L	L
2	A	D	D	D	D	D	D	D	D
3	B	D	D	D	D	D	D	D	D
4	B	E	E	E	E	E	-	-	-
5	-	-	-	-	-	-	F	F	F
6	-	G	G	G	G	G	H	H	H
7	-	-	-	-	-	-	D	D	D
8	-	D	D	D	D	D	D	D	D
9	-	I	I	I	I	I	-	-	-
10	-	J	J	J	J	J	-	-	-
11	-	D	D	D	D	D	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	D	D	D
16	-	-	-	-	-	-	D	D	D
17	-	-	-	-	-	-	K	K	K

NOTE

1. An A Code NO-GO indication is normal as indicated above under MODULE SELF TEST.
2. A NO-GO on C and L codes indicates circuit faults if the FLT STA CHECK LIST has been properly completed. If a C or L NO-GO is obtained, verify the FLT STA CHECK LIST items, then troubleshoot the indicated wiring.

M1-0101-21-119

Temperature Control Test Module
Figure 501

ZONE CENTER TEMPERATURE CONTROL

FWD CAB - DC (V9)

FWD CAB - AC (V10)

MID CAB - DC (V11)

MID CAB - AC (V12)

AFT CAB - DC (V13)

AFT CAB - AC (V14)

GALLEY - DC (V15)

GALLEY - AC (V16)

(3) Turn on electrical power (Ref. 24-00-00).

(4) On the Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, set aircraft controls for BITE test as follows:

(a) At bottom of panel, set zone trim temperature selectors at mid position (pointers at 12 o'clock).

(b) Release zone trim control switchlights, above selectors, to close position (out). CLOSE legend in each switchlight must come on.

(c) At mid panel, just below the row of six indicators, release three AUTO/MAN switchlights to manual (out) position. MNL legend in each switchlight must come on.

(d) Just above the row of six indicators, release three PACK FLOW CONTROL switchlights to close (out) position. The flowbar in each switchlight must be off.

(5) Open forward electronic service center access door 211CB (interior) or 112AB (exterior).

(6) Open cover panel on TCTM.

(7) Do module self-test as follows:

(a) Leave S1 in OFF position.

(b) Place S2 in number 1 position.

(c) Press lenses on GO, NO-GO, and TEST IN PROGRESS indicators to test lamps. Lamps must come on.

(d) Place S1 in TCTM position.

(e) Press PUSH TO TEST switch and hold. TEST IN PROGRESS indicator must come on then go off as NO-GO indicator comes on.

(f) Release PUSH TO TEST switch. NO-GO indicator must go off.

(g) Place S2 in number 2 position and repeat Steps (e) and (f).

(h) Place S2 in number 3 position.

(i) Press PUSH TO TEST switch and hold. TEST IN PROGRESS indicator must come on and then go off as GO indicator comes on.

CR (j) Repeat Steps (h) and (i) for S2 position 4.

TCTM No-Go Indications Versus Installed Equipment
Table 502

TEMPERATURE CONTROL	PACK TEMPERATURE	AMBIGUOUS INDICATIONS* TEST MODULE* CONTROLLER* FOR S2 POSITIONS
763870-1	763880-1	NONE
E 724448-5	E 724421-6	NONE
E 724448-5	763880-1	12 and 13
ED 724448-4	ED 724421-6120 and higher	2, 3, 15 and 16

Consult IPC for proper combinations of temperature controller and TCTM to avoid ambiguous indications.

CR (8) Perform pack or zone test as follows:

(a) Turn S1 to faulty pack or zone.

(b) Place S2 in sequence, to positions 1 through 4, 6, and 8 through 11 for zone tests, or positions 1 through 3, 5 through 8, and 15 through 17 for pack tests. While at each position of S2, press and

hold PUSH TO TEST switch until either GO or NO-GO indicator goes on.

(c) If GO indicator is on, place S2 in next sequence position and continue test.

(d) If NO-GO indicator is on, consult LRU REPLACEMENT CHART and LETTER CODE FOR LRU REPLACEMENT CHART on TCTM to find unit to be replaced or action to be taken (Ref. Fig. 501 Sheet 2).

(9) On completion of test, return S1 and S2 to the OFF position.

(10) Close TCTM cover panel.

(11) Close forward electronic service center access door opened in Step 3A(5).

(12) Turn off electrical power (Ref. 24-00-00).

ZONE TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

NOTE: There are five independent zone trim control subsystems for air temperature in the following zones: flight station, forward cabin, mid cabin, aft cabin and galley.

1. General

The zone trim control system provides independent selective control of air temperature in each of the following aircraft zones: the flight station, the forward cabin, the mid cabin, the aft cabin, and the galley.

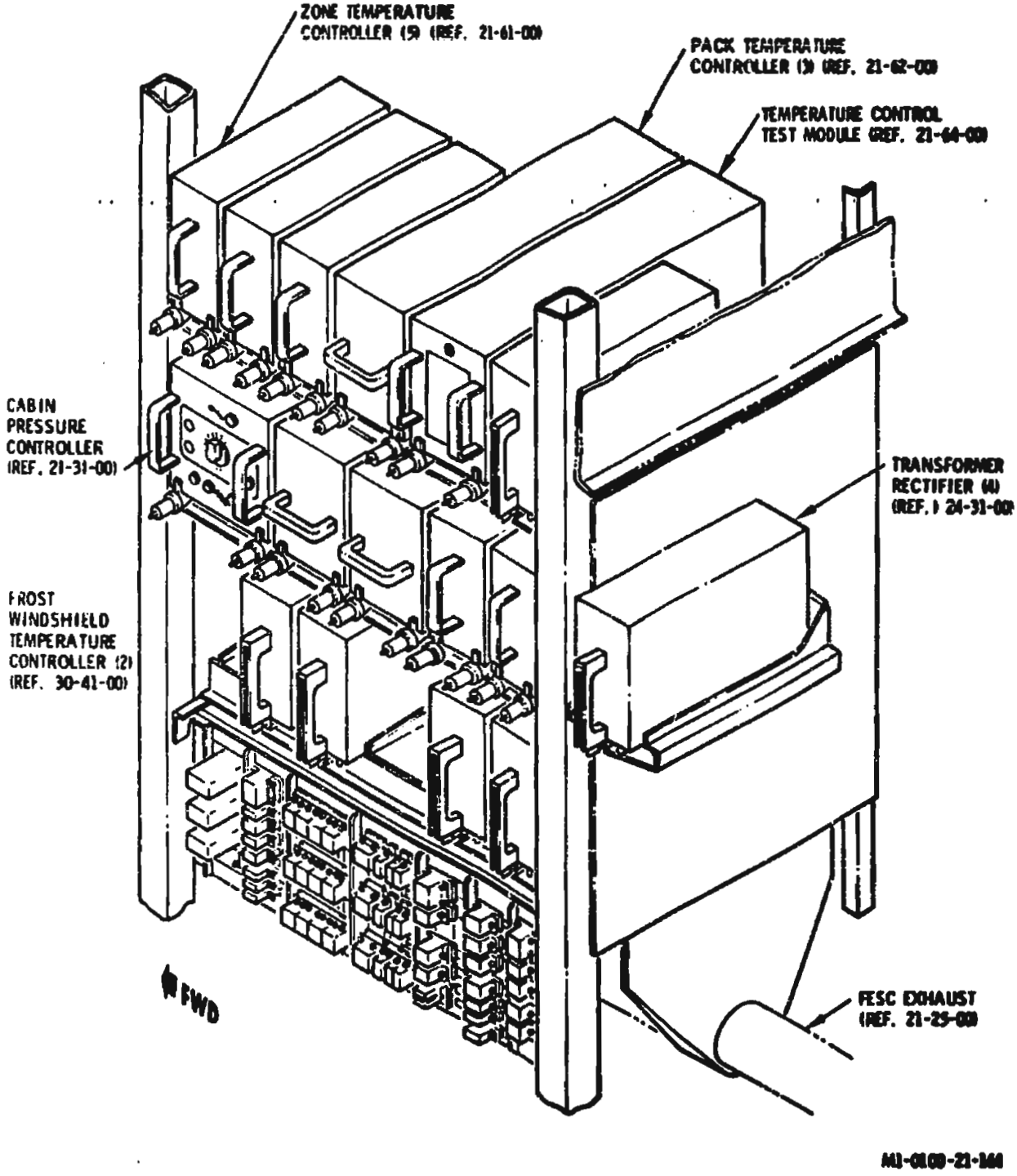
The system consists of identical zone temperature control subsystems. Major components in each of these zone control subsystems are a temperature selector, a temperature controller, a zone temperature sensor, a supply duct temperature sensor, and a trim control valve. Components common to all these subsystems are the zone trim pressure regulator, the duct overtemperature switch, and the forward electronic service center (FESC) overtemperature switch.

The air temperature in each aircraft zone is independently controlled by controlling the temperature of the supply air flowing to that zone through an individual supply air duct. Each of the zone supply air ducts receives air from the cold air plenum and (through the zone trim pressure regulator and one of the zone trim control valves) from the hot air manifold (Ref. Fig. 1 and 2).

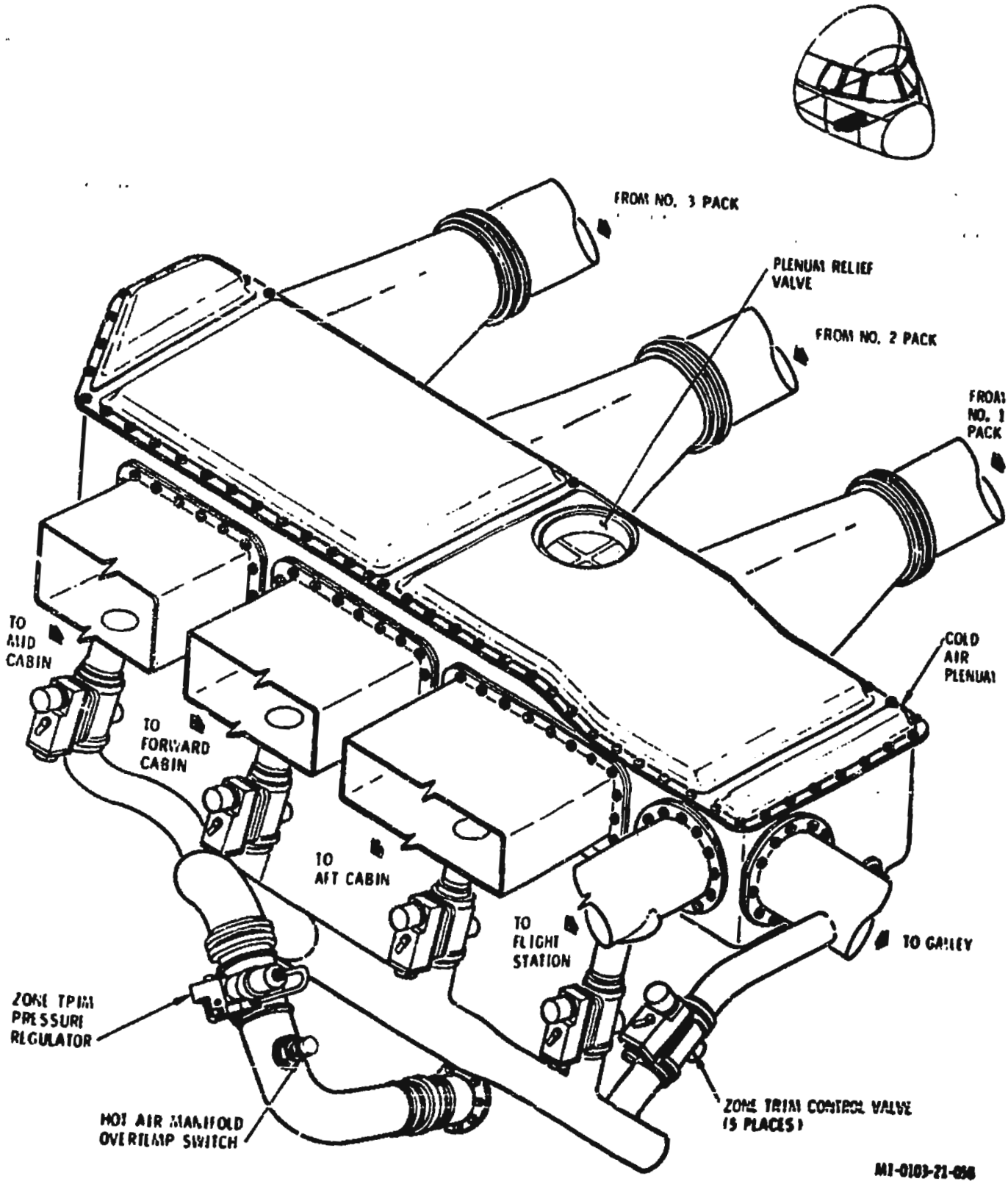
The cold air plenum receives air from all three air cycle packs, for distribution to the five temperature control zones. Baffles within the plenum direct air from the No. 1 pack primarily to the flight station and galley zone system and No. 2 and No. 3 packs to the three cabin zones.

Each of the five zone temperature controllers sends its zone temperature requirements to the pack controllers; flight station and galley zones to No. 1 pack and the three cabin zones to all three packs. Each pack controller selects the minimum temperature requested, and No. 1 pack air temperature usually will be the coldest needed for the flight station or galley and No. 2 and No. 3 packs the coldest required by any cabin zones. When No. 1 pack is not in use, flight station and galley temperature requirements are transferred to No. 2 pack and plenum baffling maintains satisfactory air distribution to the five zones.

R The hot air manifold system (Ref. 21-41-00) supplies 230 degree F (110 degree C) air to the zone trim control system (through


ZONE TEMPERATURE CONTROLLER (5) (REF. 21-61-00)
PACK TEMPERATURE CONTROLLER (1) (REF. 21-62-00)
TEMPERATURE CONTROL TEST MODULE (REF. 21-64-00)
CABIN PRESSURE CONTROLLER (REF. 21-31-00)
TRANSFORMER RECTIFIER (4) (REF.) 24-31-00)
FROST WINDSHIELD TEMPERATURE CONTROLLER (2) (REF. 30-41-00)
FWD
FESC EXHAUST (REF. 21-25-00)

Zone Trim Controller Installation
Figure 1



R
R

Zone Trim Control System
Figure 2

EFFECTIVITY: ALL

A

the two hot air manifold isolation valves and the zone trim pressure regulator valve) to each of the zone trim control valves.

The zone trim pressure regulator valve is in the duct taking hot air from both hot air manifold isolation valves forward to the zone trim manifold and limits trim air pressure to reduce air movement noise at the zone trim valves.

Since the cold air plenum air temperature is that needed for the cooler zones, the other zones need warmer supply air. The warmer air is obtained by controlling the opening of the individual zone trim control valves; each valve adding the quantity of hot air needed to provide the required mixed air temperature to each zone.

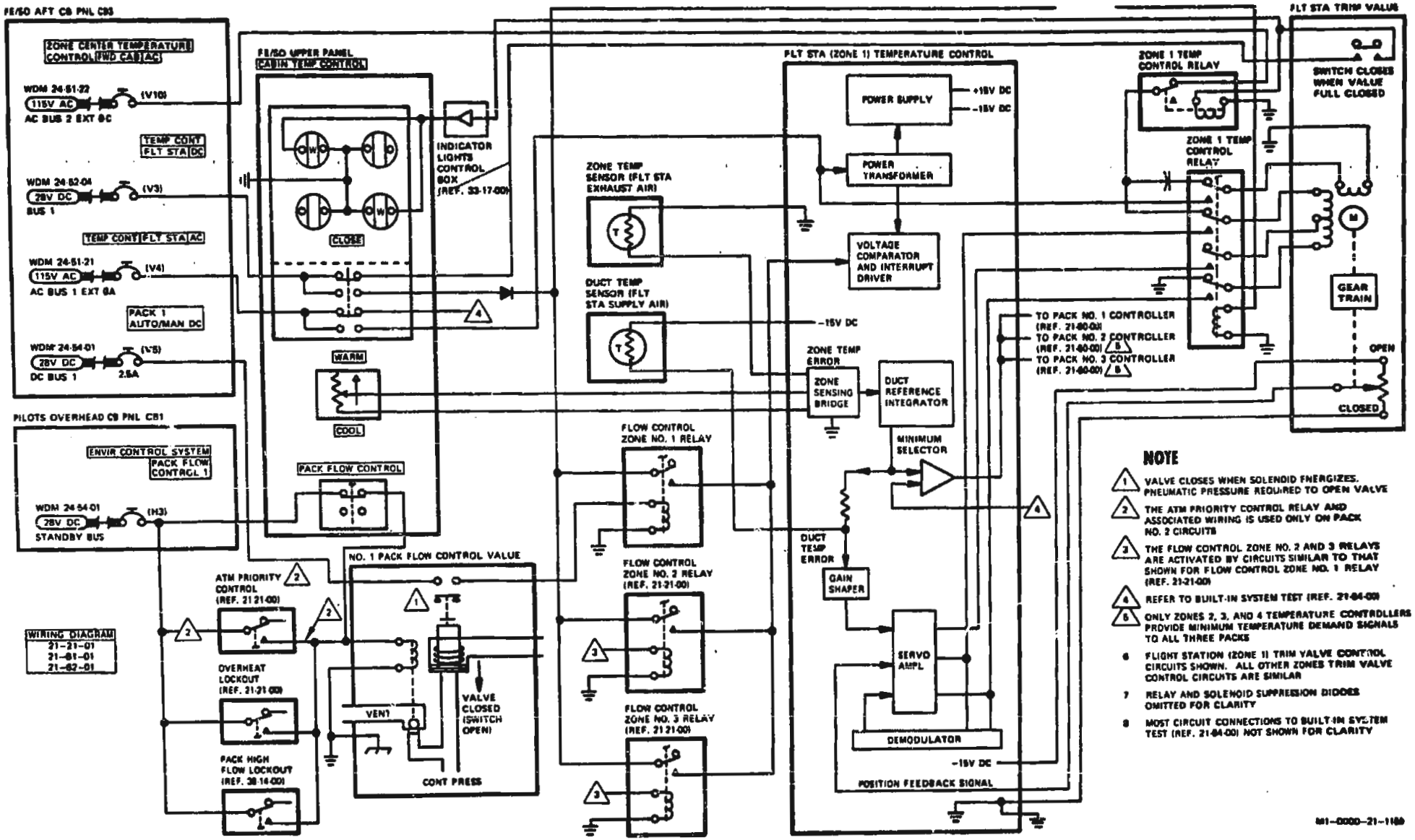
R The zone temperature selectors are potentiometers mounted near the bottom of the Flight Engineer/Second Officers ENGINE BLEED CONTROL panel. Individual zone temperature selection is from 65 to 85 degrees F (18 to 29 degrees C) (Ref. Fig. 3).

Zone trim switchlights (one above each temperature selector) provide override control of individual zone temperature control system operation by closing the applicable zone trim shutoff valve.

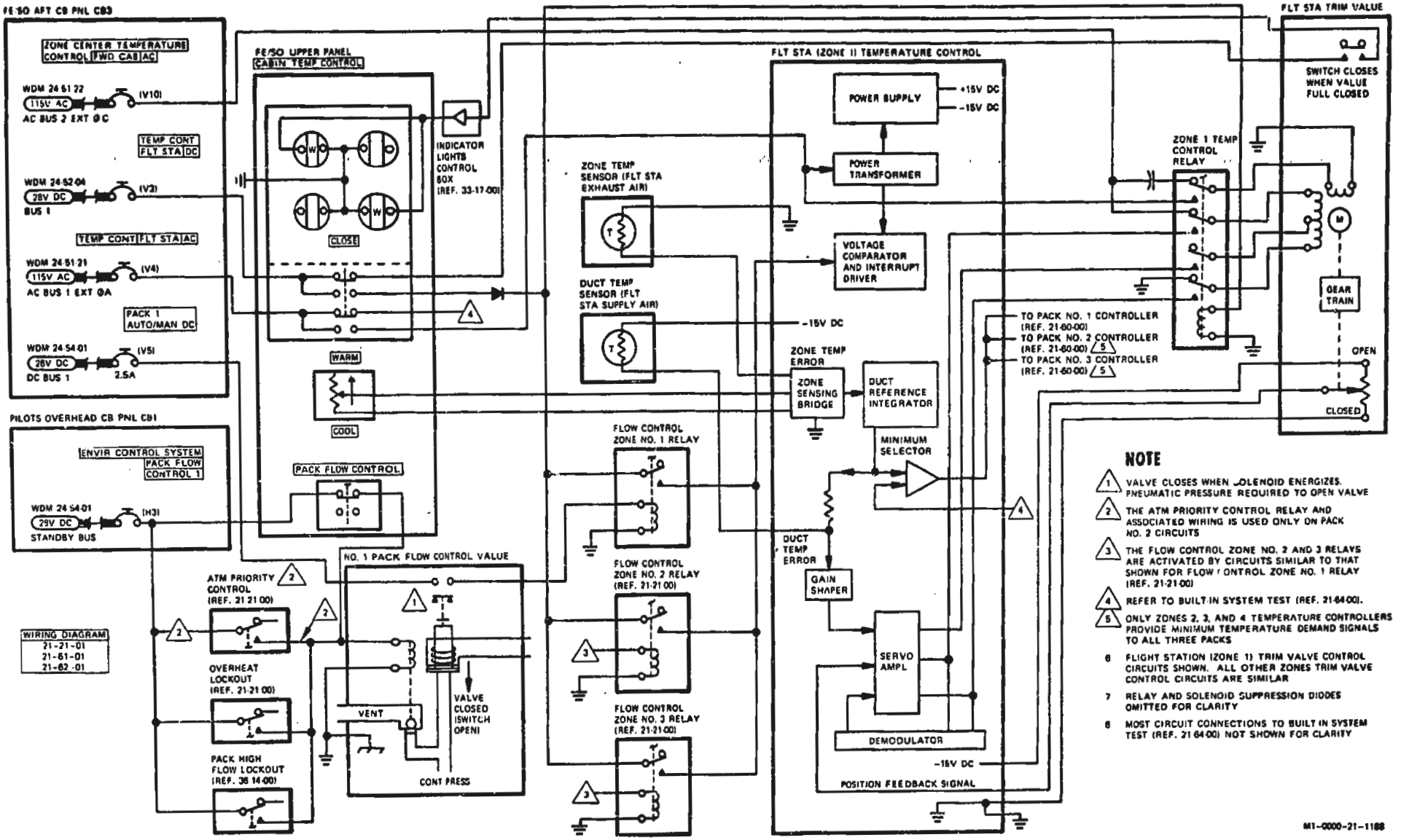
The two ISLN VALVE switchlights above the zone trim valve switchlights provide on-off control for the zone trim control system by individual control (opening or closing) of the hot air manifold isolation valves.

The zone temperature controllers are solid state devices that are rack-mounted in the forward electronic compartment, zone 112. Each controller receives electrical signals representing zone temperature selection, air temperature in the zone, supply duct air temperature to the zone, and zone trim valve position. The controller modulates valve position to provide the supply duct air temperature that results in the selected zone air temperature. Each zone temperature controller also provides a signal to the air cycle pack control system (Ref. 21-62-00) representing the required duct air temperature for that zone.

The zone temperature sensors and the duct temperature sensors are negative coefficient thermistor-type sensors. Each zone temperature sensor is mounted in the zone it helps to control. Each zone sensor is in a position to sense the average temperature of the zone. Each duct temperature sensor is in the supply air duct serving that zone.


FE/SO AFT CB PNL CB3
ZONE CENTER TEMPERATURE CONTROL FWD CAB AC
WDM 24-51-22
115V AC
(V10)
AC BUS 2 EXT BC
TEMP CONT FLT STA DC
WDM 24-52-04
28V DC
(V3)
BUS 1
TEMP CONT FLT STA AC
WDM 24-51-21
115V AC
(V4)
AC BUS 1 EXT BA
PACK 1 AUTO/MAN DC
WDM 24-54-01
28V DC
(V5)
2.5A
DC BUS 1
PILOTS OVERHEAD CB PNL CB1
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1
WDM 24-54-01
28V DC
(H3)
STANDBY BUS
WIRING DIAGRAM
21-21-01
21-61-01
21-62-01
FE/SO UPPER PANEL CABIN TEMP CONTROL
CLOSE
WARM
COOL
PACK FLOW CONTROL
INDICATOR LIGHTS CONTROL BOX (REF. 33-17-00)
ATM PRIORITY CONTROL (REF. 21-21-00)
OVERHEAT LOCKOUT (REF. 21-21-00)
PACK HIGH FLOW LOCKOUT (REF. 38-14-00)
NO. 1 PACK FLOW CONTROL VALVE
VENT
VALVE CLOSED (SWITCH OPEN)
CONT PRESS
ZONE TEMP SENSOR (FLT STA EXHAUST AIR)
DUCT TEMP SENSOR (FLT STA SUPPLY AIR)
FLOW CONTROL ZONE NO. 1 RELAY
FLOW CONTROL ZONE NO. 2 RELAY (REF. 21-21-00)
FLOW CONTROL ZONE NO. 3 RELAY (REF. 21-21-00)
FLT STA (ZONE 1) TEMPERATURE CONTROL
POWER SUPPLY
+15V DC
-15V DC
POWER TRANSFORMER
VOLTAGE COMPARATOR AND INTERRUPT DRIVER
-15V DC
ZONE TEMP ERROR
ZONE SENSING BRIDGE
DUCT REFERENCE INTEGRATOR
MINIMUM SELECTOR
DUCT TEMP ERROR
GAIN SHAPER
SERVO AMPL
DEMODULATOR
-15V DC
POSITION FEEDBACK SIGNAL
ZONE 1 TEMP CONTROL RELAY
ZONE 1 TEMP CONTROL RELAY
TO PACK NO. 1 CONTROLLER (REF. 21-60-00)
TO PACK NO. 2 CONTROLLER (REF. 21-60-00) 5
TO PACK NO. 3 CONTROLLER (REF. 21-60-00) 5
FLT STA TRIM VALVE
SWITCH CLOSES WHEN VALVE FULL CLOSED
GEAR TRAIN
OPEN
CLOSED
NOTE
1 VALVE CLOSES WHEN SOLENOID ENERGIZES. PNEUMATIC PRESSURE REQUIRED TO OPEN VALVE
2 THE ATM PRIORITY CONTROL RELAY AND ASSOCIATED WIRING IS USED ONLY ON PACK NO. 2 CIRCUITS
3 THE FLOW CONTROL ZONE NO. 2 AND 3 RELAYS ARE ACTIVATED BY CIRCUITS SIMILAR TO THAT SHOWN FOR FLOW CONTROL ZONE NO. 1 RELAY (REF. 21-21-00)
4 REFER TO BUILT-IN SYSTEM TEST (REF. 21-64-00)
5 ONLY ZONES 2, 3, AND 4 TEMPERATURE CONTROLLERS PROVIDE MINIMUM TEMPERATURE DEMAND SIGNALS TO ALL THREE PACKS
6 FLIGHT STATION (ZONE 1) TRIM VALVE CONTROL CIRCUITS SHOWN. ALL OTHER ZONES TRIM VALVE CONTROL CIRCUITS ARE SIMILAR
7 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
8 MOST CIRCUIT CONNECTIONS TO BUILT-IN SYSTEM TEST (REF. 21-64-00) NOT SHOWN FOR CLARITY

R Typical Zone Trim Control System Simplified Schematic
R Figure 3


FE-SO AFT CB PNL CB3
ZONE CENTER TEMPERATURE CONTROL FWD CAB AC
WDM 24-51-22
115V AC
(V10)
AC BUS 2 EXT @C
TEMP CONT FLT STA DC
WDM 24-52-04
28V DC
(V3)
BUS 1
TEMP CONT FLT STA AC
WDM 24-51-21
115V AC
(V4)
AC BUS 1 EXT @A
PACK 1 AUTO/MAN DC
WDM 24-54-01
28V DC
(V5)
2.5A
DC BUS 1
PILOTS OVERHEAD CB PNL CB1
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1
WDM 24-54-01
28V DC
(H3)
STANDBY BUS
WIRING DIAGRAM
21-21-01
21-61-01
21-62-01
FE/SO UPPER PANEL
CABIN TEMP CONTROL
CLOSE
WARM
COOL
PACK FLOW CONTROL
INDICATOR LIGHTS CONTROL BOX (REF. 33-17-00)
ATM PRIORITY CONTROL (REF. 21-21-00)
OVERHEAT LOCKOUT (REF. 21-21-00)
PACK HIGH FLOW LOCKOUT (REF. 36-14-00)
NO. 1 PACK FLOW CONTROL VALVE
VENT
VALVE CLOSED (SWITCH OPEN)
CONT PRESS
FLOW CONTROL ZONE NO. 1 RELAY
FLOW CONTROL ZONE NO. 2 RELAY (REF. 21-21-00)
FLOW CONTROL ZONE NO. 3 RELAY (REF. 21-21-00)
FLT STA (ZONE 1) TEMPERATURE CONTROL
POWER SUPPLY
+15V DC
-15V DC
POWER TRANSFORMER
ZONE TEMP SENSOR (FLT STA EXHAUST AIR)
VOLTAGE COMPARATOR AND INTERRUPT DRIVER
DUCT TEMP SENSOR (FLT STA SUPPLY AIR)
-15V DC
ZONE TEMP ERROR
ZONE SENSING BRIDGE
DUCT REFERENCE INTEGRATOR
MINIMUM SELECTOR
DUCT TEMP ERROR
GAIN SHAPER
SERVO AMPL
DEMODULATOR
-15V DC
POSITION FEEDBACK SIGNAL
TO PACK NO. 1 CONTROLLER (REF. 21-60-00)
TO PACK NO. 2 CONTROLLER (REF. 21-60-00) 5
TO PACK NO. 3 CONTROLLER (REF. 21-60-00) 5
ZONE 1 TEMP CONTROL RELAY
GEAR TRAIN
OPEN
CLOSED
FLT STA TRIM VALVE
SWITCH CLOSES WHEN VALVE FULL CLOSED
NOTE
1 VALVE CLOSES WHEN SOLENOID ENERGIZES. PNEUMATIC PRESSURE REQUIRED TO OPEN VALVE
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5 ONLY ZONES 2, 3, AND 4 TEMPERATURE CONTROLLERS PROVIDE MINIMUM TEMPERATURE DEMAND SIGNALS TO ALL THREE PACKS
6 FLIGHT STATION (ZONE 1) TRIM VALVE CONTROL CIRCUITS SHOWN. ALL OTHER ZONES TRIM VALVE CONTROL CIRCUITS ARE SIMILAR
7 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
8 MOST CIRCUIT CONNECTIONS TO BUILT-IN SYSTEM TEST (REF. 21-64-00) NOT SHOWN FOR CLARITY
M1-0000-21-1188

Typical Zone Trim Control System Simplified Schematic
Figure 3

2. Operation

The zone trim control system and the zone temperature control systems which comprise the system are operational only when the air conditioning supply system (Ref. 21-21-00) has opened one or more pack flow control valves to operate the corresponding air cycle pack control systems (Ref. 21-62-00), and when the hot air manifold system (Ref. 21-41-00) is operating to deliver hot air to the trim valves.

A. Functional Operation

Operation of the zone trim control system is initiated when the two ISLN VALVE switchlights (Ref. 21-41-00) and the zone trim control valve switchlights on the Flight Engineer/Second Officers ENGINE BLEED CONTROL panel are depressed (latched in), and when both cold air plenum and hot air manifold air is available to the system.

With the isolation valves open, hot air is ducted to the zone trim control valves through the zone trim pressure regulator valve. With those switchlights depressed, each valve is controlled by the corresponding zone temperature controller. If one of the switchlights is released, the applicable valve control circuit is overriden to close the valve and disable the applicable zone temperature control system. When the valve is closed, the CLOSE legend in the switchlight comes on.

When all of the zone trim control valve switchlights are depressed, the valves will each be positioned by its zone temperature controller. The individual valve is positioned such that the proper quantity of trim air is added to the air from the cold air plenum to provide the required mixed supply air temperature to the applicable zone. Since the plenum air temperature is controlled to that required for one or more zones, zone trim valves for those zones may be R completely closed. Zone trim valves for the other zones will be open, as necessary.

B. Electrical Circuit Operation

Since the zone temperature control systems within the zone trim control system operate identically, only the flight station system (zone 1) will be described (Ref. Fig. 3).

When the FLT STA zone trim control switchlight is depressed, 28V dc from one switchlight contact is applied to energize the zone temp control relay. At the same time 28V dc is applied through one of the open pack flow control valves position switches to energize the appropriate pack flow control/zone relay. Contacts of any of the three pack flow

control/zone relays (in parallel) apply 28V dc to the zone 1 temperature controller. When the zone 1 temperature control relay closes, the zone trim control valve motor windings are connected to the zone 1 temperature controller for automatic control of the valve. At the same time, 115V ac, 400 Hz, Phase A power is applied through another contact of the same switchlight to the controller, making it ready to control the zone trim control valve.

If the FLT STA switchlight is released (out), both the 115V ac and the 28V dc are removed from the zone controller, and the zone 1 temperature control relay is deenergized. At the same time, 115V ac, 400 Hz, Phase C power is applied through normally closed contacts on the zone 1 temperature control relay to the close winding of the valve motor. The 115V ac, 400 Hz, Phase C power is phase-shifted by a capacitor and applied through other normally closed contacts of the temperature control relay to the valve motor field windings to close the valve. When the valve closes, the close position limit switch applies 28V dc to light the CLOSE legend of the FLT STA switchlight.

3. Humidity Control

For system operation under high humidity conditions, the humidity control system provides removal of the maximum amount of moisture from pack discharge air. When the humidity control system is selected for use (Ref. Fig. 4) the zone controllers are disconnected from the pack controllers and a simulated demand for 38 degrees F (2 degrees C) pack discharge temperature is supplied to all three pack controllers. The zone trim system then adds hot air from the hot air manifold to achieve required zone temperatures in all zones.

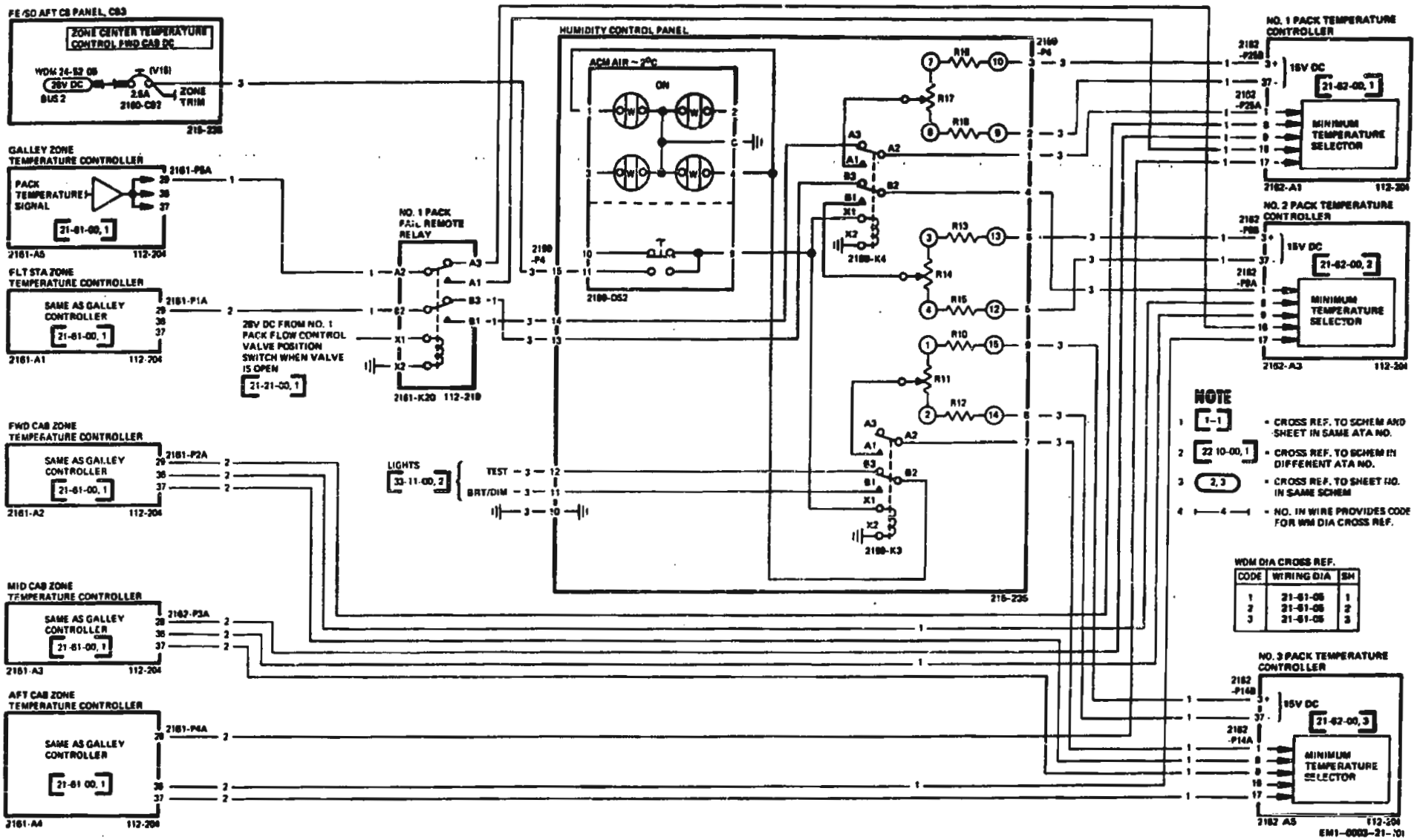
4. Zone Temperature Controller

A. Description

The zone temperature controller is a solid state device used to control zone supply air temperature by controlling a zone trim control valve. Five interchangeable controllers one for each of the five temperature control zones in the aircraft, are used. These zones are the flight station, the forward cabin, the mid cabin, the aft cabin, and the galley.

The controllers are rack-mounted in the right central portion of the forward electronic service center, zone 112.

Each controller receives electrical signals representing the zone temperature selection, the air temperature in that



R Zone/Pack Temperature Controllers Interconnection Schematic
R Figure 4

EFFECTIVITY: ALL

zone, the supply duct air temperature to that zone, and the zone trim control valve position. Using this information, the controller positions the zone trim control valve as necessary to achieve the required supply air temperature that in turn will result in achieving the selected zone air temperature.

The zone temperature controllers also supply the pack temperature controllers (Ref. 21-62-00) with signals representing the required supply duct air temperature for each zone. The air cycle pack control system (Ref. 21-62-00) uses zone temperature requirements to control pack discharge temperature.

5. Pressure Regulator Valve

A. Description

The zone trim pressure regulator is a pneumatically operated valve consisting of a pneumatic control with piston driven linkage connected to a butterfly-type valve. Two ground check ports are provided for on ground testing of valve operation. The valve is installed in the trim system supply air duct in the forward electronic service center (FESC), between the hot air manifold system and the zone trim control valves.

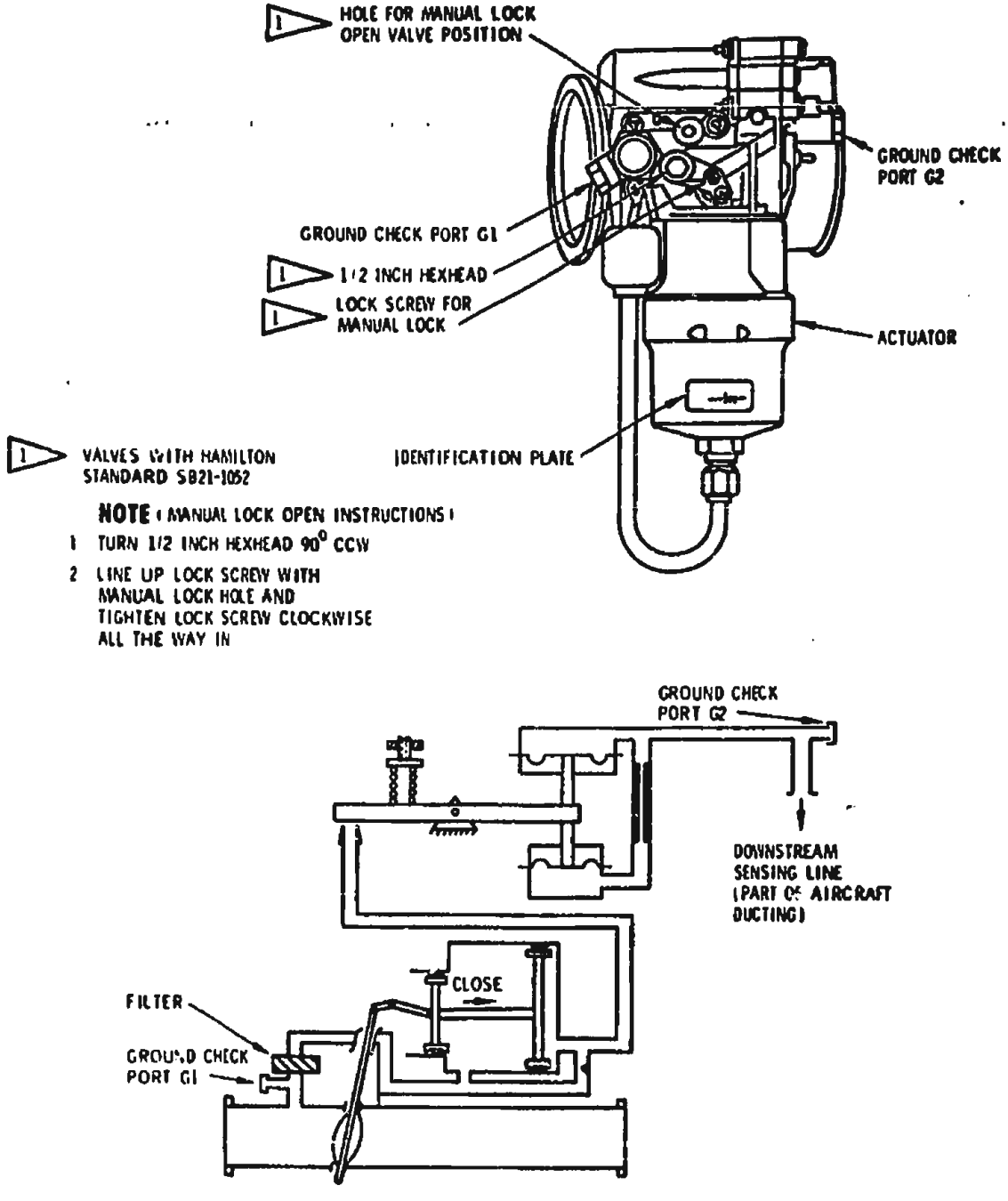
On valves with Hamilton Standard SB21-1052, a valve override actuator arm is mounted on the end of the butterfly valve shaft. The manual override arm may be used to manually open the valve. A lock screw, when installed in the arm, locks the valve in the open position.

B. Operation

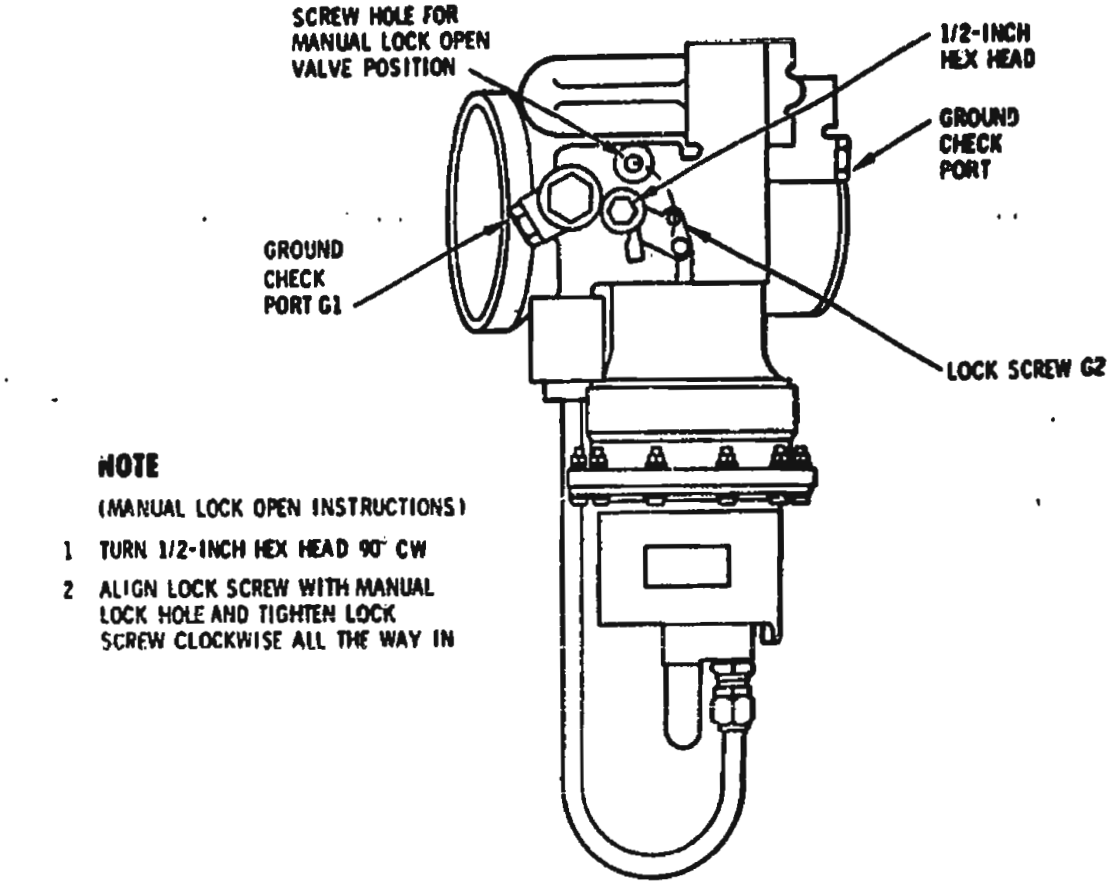
The zone trim pressure regulator valve senses and controls supply air pressure to the zone trim control valves. When the hot air manifold system is operating and one or more of the zone trim control valves is open, the pressure regulator valve opens or closes as necessary to maintain supply air pressure between 4 to 10 psig. (Ref. Fig. 5).

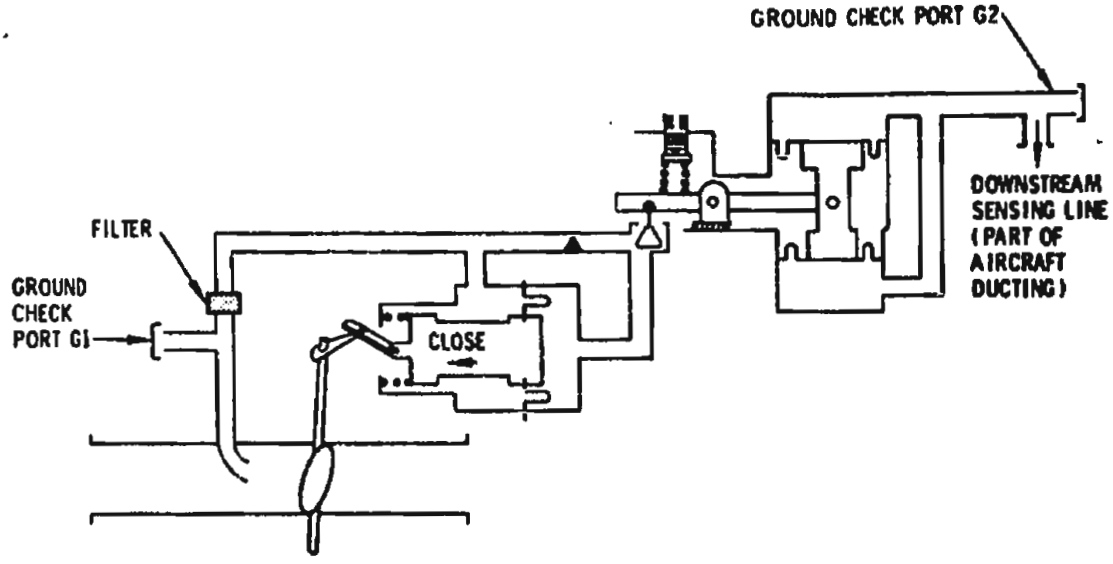
On valves without Hamilton Standard SB21-1100, the zone trim pressure regulator is a fail-closed type valve.

On valves with Hamilton Standard SB21-1100, the zone trim pressure regulator is a fail-open type valve.


1 HOLE FOR MANUAL LOCK OPEN VALVE POSITION
GROUND CHECK PORT G2
GROUND CHECK PORT G1
1 1/2 INCH HEXHEAD
1 LOCK SCREW FOR MANUAL LOCK
ACTUATOR
IDENTIFICATION PLATE
1 VALVES WITH HAMILTON STANDARD SB21-1052
NOTE (MANUAL LOCK OPEN INSTRUCTIONS)
1 TURN 1/2 INCH HEXHEAD 90° CCW
2 LINE UP LOCK SCREW WITH MANUAL LOCK HOLE AND TIGHTEN LOCK SCREW CLOCKWISE ALL THE WAY IN
GROUND CHECK PORT G2
DOWNSTREAM SENSING LINE (PART OF AIRCRAFT DUCTING)
CLOSE
FILTER
GROUND CHECK PORT G1
MI-0101-21-263

Zone Trim Pressure Regulator Valve
Figure 5


SCREW HOLE FOR MANUAL LOCK OPEN VALVE POSITION
1/2-INCH HEX HEAD
GROUND CHECK PORT
GROUND CHECK PORT G1
LOCK SCREW G2
NOTE
(MANUAL LOCK OPEN INSTRUCTIONS)
1 TURN 1/2-INCH HEX HEAD 90° CW
2 ALIGN LOCK SCREW WITH MANUAL LOCK HOLE AND TIGHTEN LOCK SCREW CLOCKWISE ALL THE WAY IN



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Zone Trim Pressure Regulator Valve
Figure 5

EFFECTIVITY: VALVES WITH HAMILTON STANDARD
SE21-1100

6. Control Valve

A. Description

The zone trim control valve is a flange- and bracket-mounted, 2.5-inch-diameter, electrically actuated, butterfly-type modulating and shutoff valve. The valve actuator consists of a servoamplifier-controlled 115V ac electric motor, a reduction gear train, a closed position limit switch, and two valve position feedback potentiometers. One potentiometer is used by the zone temperature controller to control valve position. The second potentiometer is not used. The closed position limit switch is used to deenergize both the excitation and control motor windings and to light the CLOSE legend in the control/indicator switchlight when the valve is fully closed.

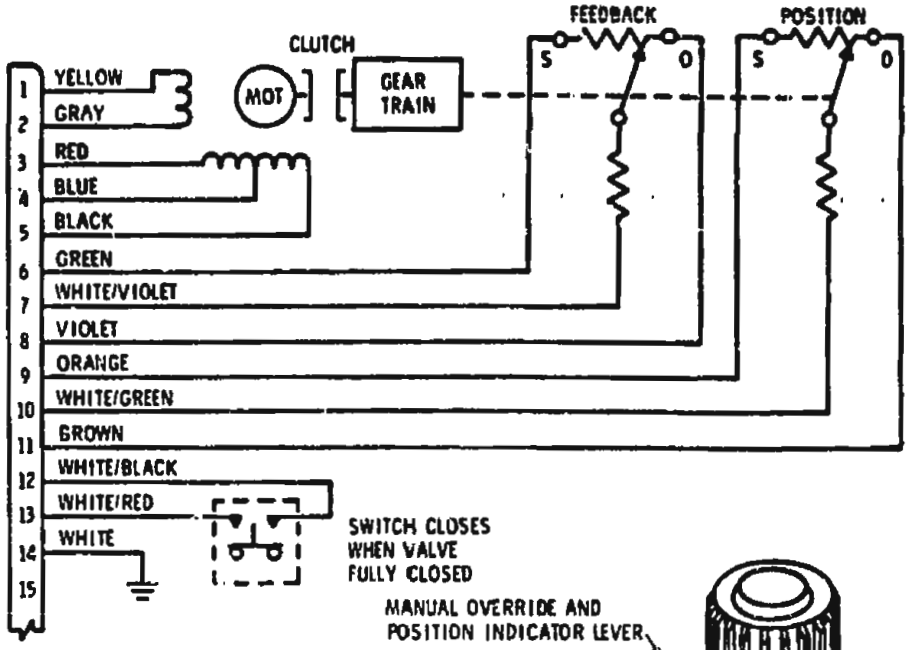
A manual override and valve position indicator are provided on top of the actuator end of the butterfly shaft. A manual override release lever used to disconnect the reduction gear train is located on the side of the actuator. If the circuit or the actuator malfunctions, the valve butterfly can be manually closed (Ref. Fig. 6).

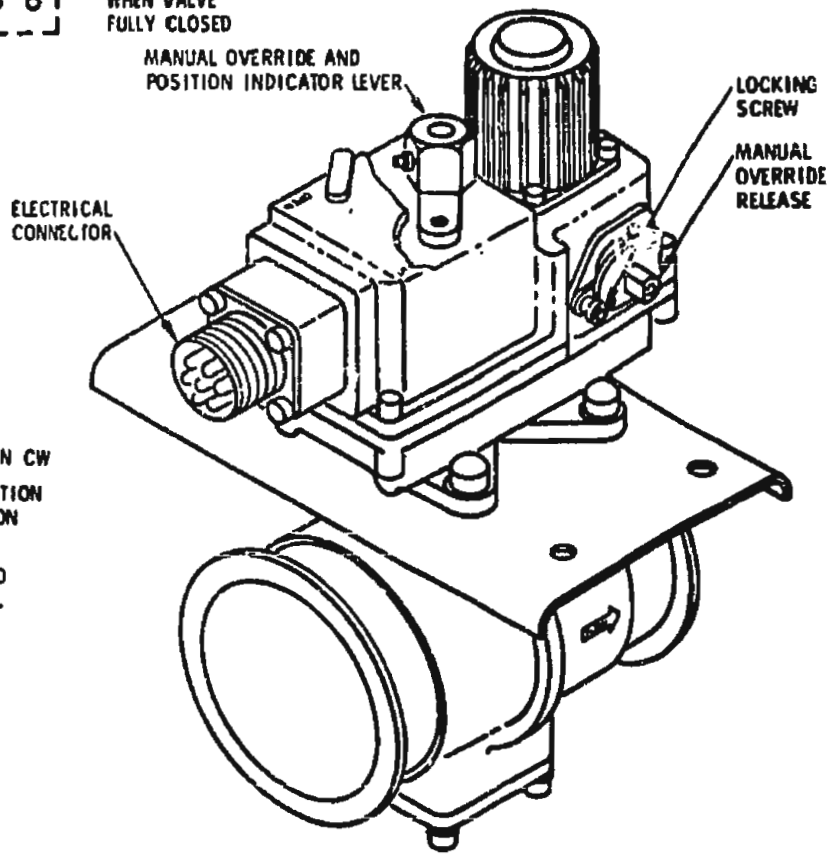
All the zone trim control valves are installed on the right side of the forward electronic compartment, zone 113. Each valve attaches to a stub duct takeoff on the duct downstream of the hot air manifold isolation valves.

B. Operation

Control of individual zone trim control valves is provided through the FLT STA, FWD CAB, MID CAB, AFT CAB, and GALLEY switchlights on the Flight Engineer/Second Officers ENGINE BLEED CONTROL panel.

When the switchlights are depressed (latched in), the corresponding zone trim control valves respond to the demands of each of the zone temperature controllers. When an individual switchlight is released (out), the normal control circuit to that valve is disabled, the valve closes, and the CLOSE legend in that switchlight comes on.





NOTE

MANUAL POSITIONING AND LOCKING INSTRUCTIONS:

1. REMOVE LOCKING SCREW
2. TURN MANUAL OVERRIDE RELEASE APPROXIMATELY ONE-QUARTER TURN CW
3. TURN MANUAL OVERRIDE AND POSITION INDICATOR LEVER TO SHUT POSITION
4. INSERT LOCKING SCREW THROUGH HOLE IN POSITION INDICATOR INTO HOUSING. TORQUE TO 20-30 LB IN. LOCKING SCREW MUST BOTTOM ON INDICATOR LEVER

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Zone Trim Control Valve
Figure 6

R # ZONE TRIM CONTROL SYSTEM - FAULT ISOLATION

R 1. General

R The diagrams and schematics in this section can be used for
R fault isolation any time a fault is reported or suspected. The
R PREREQUISITES listed at the top of each fault isolation diagram
R must be satisfied prior to starting fault isolation. Uncommon
R abbreviations are defined on the using fault code diagram or
R schematic.

R If the flight crew reports a trouble using a fault code number,
R the code number can be found in the Fault Isolation Reference
R Table in the Chapter 21 Fault Code Index. The index specifies
R the exact maintenance manual section, fault isolation diagram,
R and block number on the diagram where the fault isolation
R procedure should start. Schematics are included at the end of
R the section to supplement the fault isolation diagrams or as an
R aid in isolating a problem not covered on the diagrams.

R Refer to the Maintenance Manual Introduction for a more detailed
R discussion of the Fault Isolation Reporting Method (FIRM) and
R use of fault isolation diagrams/schematics.

R Because of electrical interconnection and functional interaction
R between systems, system operation fault isolation/identification
R procedures covering the Zone Trim Control System are included as
R part of those for the Air Conditioning System (Ref. 21-00-00).

R The following procedure provides fault isolation/identification
R data for the zone trim control system portion of the built-in
R system test equipment (BITE) capability provided by the
R temperature control test module (TCTM).

R 2. Referenced Procedures

R 21-00-00 Air Conditioning System - Fault Isolation

R 21-64-00 Built-In System Test - Fault Isolation

R 3. Fault Isolation/Identification

R Table 101 lists the fault isolation diagrams and schematics in
R this section.

R TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
103	Flight Station or Galley Zone Temperature Control Fault
104	Forward, Mid, or Aft Cabin Zone Temperature Control Fault
105	Zone Trim Valve CLOSE Light Fault
SCHEM 1	Typical Zone Trim Control System Schematic
SCHEM 2	Zone Trim Control Test Modes Schematic

R A. Procedure

R (1) Perform fault isolation/identification procedure for self-test of TCTM (Ref. 21-64-00).

R (2) Perform BITE and fault isolation/identification procedures for zone trim control system components and circuits by following procedure detailed on TCTM flip charts, using schematics for fault isolation as pertinent.

R (3) Repair aircraft circuits or replace faulty component as required.

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR – RAM AIR EXHAUST VALVE	3	HX COMPTS/115AL-1, 116AR-1, 116BR-1	21-62-04
CABIN TEMP CONTROL			
AFT CAB	1	FE/SO UPPER PANEL/215	•
FLT STA	1	FE/SO UPPER PANEL/215	•
FWD CAB	1	FE/SO UPPER PANEL/215	•
GALLEY	1	FE/SO UPPER PANEL/215	•
MID CAB	1	FE/SO UPPER PANEL/215	•
CIRCUIT BREAKERS			
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1 (2121-CB1)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (H3)/210	•
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 2 (2121-CB3)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (H4)/210	•
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 3 (2121-CB4)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (H5)/210	•
MISC – ANN RESET	1	CIRCUIT BREAKER PANEL NO. 1 (CB1) (L9)/210	•
PACK 1 AUTO/MAN – AC (2162-CB1)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V6)/215	•
PACK 1 AUTO/MAN – DC (2162-CB2)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V5)/215	•
PACK 2 AUTO/MAN – AC (2162-CB3)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V8)/215	•
PACK 2 AUTO/MAN – DC (2162-CB4)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V7)/215	•

*SEE WM EQUIPMENT LIST

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Component Location Index
Figure 101 (Sheet 1)

EFFECTIVITY: ALL

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COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS (CONT.)			
PACK 3 AUTO/MAN-AC (2162-CB7)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V18); 215	•
PACK 3 AUTO/MAN-DC (2162-CB6)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V17); 215	•
TEMP CONTROL FLT STA-AC (2160-CB8)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V4); 215	•
TEMP CONTROL FLT STA-DC (2160-CB1)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V3); 215	•
ZONE CENTER TEMP CONTROL AFT CAB-AC (2160-CB11)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V14); 215	•
ZONE CENTER TEMP CONTROL AFT CAB-DC (2161-CB4)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V13); 215	•
ZONE CENTER TEMP CONTROL FWD CAB-AC (2161-CB9)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V10); 215	•
ZONE CENTER TEMP CONTROL FWD CAB-DC (2161-CB2)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V9); 215	•
ZONE CENTER TEMP CONTROL GALLEY-AC (2160-CB12)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V16); 215	•
ZONE CENTER TEMP CONTROL GALLEY-DC (2161-CB5)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V15); 215	•
ZONE CENTER TEMP CONTROL MID CAB-AC (2160-CB10)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V12); 215	•
ZONE CENTER TEMP CONTROL MID CAB-DC (2161-CB3)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3) (V11); 215	•

*SEE WM EQUIPMENT LIST

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COMPONENT	QTY	AREA/ACCESS	REFERENCE
CONTROL BOX - INDICATOR LIGHTS			
ILCB CARDS			
FLT STA, FWD, MID, AFT CABIN: 1A32	1	FESC, INDICATOR LIGHTS CONTROL BOX/112AB, 211CB	33-17-04
GALLEY: 1A22	1	FESC, INDICATOR LIGHTS CONTROL BOX/112AB, 211CB	33-17-04
CONTROL SENSORS			
SENSOR - ZONE TEMPERATURE, AFT CABIN	1	RH PSM FS 1580	21-61-18
SENSOR - ZONE TEMPERATURE, FLT STA (ON AIRCRAFT 001-031)	1	RIGHT CORNER ABOVE FLIGHT STATION ENTRY DOOR/212	21-61-17
SENSOR - ZONE TEMPERATURE, FLT STA (ON AIRCRAFT 032-999)	1	BEHIND AIR GRILL BELOW FE SO WORK TABLE/215	21-61-17
SENSOR - ZONE TEMPERATURE, FWD CABIN	1	RH PSM FS 565	21-61-18
SENSOR - ZONE TEMPERATURE, GALLEY	1	GALLEY FWD BULKHEAD 131	21-61-21
SENSOR - ZONE TEMPERATURE, MID CABIN	1	RH PSM FS 1020	21-61-18
INDICATION SENSORS			
SENSOR - ZONE TEMPERATURE, AFT CABIN	1	RH PSM FS 1580	21-61-18
SENSOR - ZONE TEMPERATURE, FLT STA (ON AIRCRAFT 001-031)	1	RIGHT CORNER ABOVE FLIGHT STATION ENTRY DOOR 212	21-61-17
SENSOR - ZONE TEMPERATURE, FLT STA (ON AIRCRAFT 032-999)	1	BEHIND AIR GRILL BELOW FE SO WORK TABLE 215	21-61-17

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R R Component Location Index
Figure 101 (Sheet 3)

R EFFECTIVITY: ALL
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COMPONENT	QTY	AREA/ACCESS	REFERENCE
INDICATION SENSORS			
SENSOR – ZONE TEMPERATURE, FWD CABIN	1	RH PSM; FS 565	21-61-18
SENSOR – ZONE TEMPERATURE, GALLEY	1	GALLEY FWD BULKHEAD; 131	21-61-21
SENSOR – ZONE TEMPERATURE, MID-CABIN	1	RH PSM; FS 1020	21-61-18
INSTRUMENT COOLING FAN	1	FESC, BEHIND RIGHT ELECTRICAL RACK; 112AB	21-25-21
RELAYS			
AFT CABIN ZONE TEMP CONTROL (2161-K12)	1	FESC, BEHIND ZONE CONTROLLERS, REMOVE RESPECTIVE CONTROLLER FOR ACCESS; 112AB	*
FLT STA ZONE TEMP CONTROL (2161-K3)	1	FESC, BEHIND ZONE CONTROLLERS, REMOVE RESPECTIVE CONTROLLER FOR ACCESS, 112AB	*
FWD CABIN ZONE TEMP CONTROL (2161-K6)	1	FESC, BEHIND ZONE CONTROLLERS, REMOVE RESPECTIVE CONTROLLER FOR ACCESS; 112AB	*
GALLEY ZONE TEMP CONTROL (2161-K15)	1	FESC, BEHIND ZONE CONTROLLERS, REMOVE RESPECTIVE CONTROLLER FOR ACCESS; 112AB	*
MID CABIN ZONE TEMP CONTROL (2161-K9)	1	FESC, BEHIND ZONE CONTROLLERS, REMOVE RESPECTIVE CONTROLLER FOR ACCESS; 112AB	*
PACK NO. 1 FAIL REMOTE (2161-K20)	1	FESC, ON RELAY PANEL BELOW RIGHT ELECTRICAL RACK; 112AB	*

*SEE WM EQUIPMENT LIST

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R R Component Location Index
Figure 101 (Sheet 4)

R R 001B EFFECTIVITY: ALL

COMPONENT	QTY	AREA/ACCESS	REFERENCE
SWITCHLIGHTS			
AFT CAB	1	FE/SO STATION, CABIN TEMP CONTROL PANEL; 215	20-33-01
FLT STA	1	FE/SO STATION, CABIN TEMP CONTROL PANEL; 215	20-33-01
FWD CAB	1	FE/SO STATION, CABIN TEMP CONTROL PANEL; 215	20-33-01
GALLEY	1	FE/SO STATION, CABIN TEMP CONTROL PANEL; 215	20-33-01
MID CAB	1	FE/SO STATION, CABIN TEMP CONTROL PANEL; 215	20-33-01
TEMPERATURE CONTROLLERS			
AFT CABIN – ZONE 4	1	FESC, RIGHT ELECTRICAL RACK: 112AB	*
FLIGHT STATION – ZONE 1	1	FESC, RIGHT ELECTRICAL RACK; 112AB	*
FORWARD CABIN – ZONE 2	1	FESC, RIGHT ELECTRICAL RACK; 112AB	*
GALLEY – ZONE 5	1	FESC, RIGHT ELECTRICAL RACK; 112AB	*
MID CABIN – ZONE 3	1	FESC, RIGHT ELECTRICAL RACK; 112AB	*
ZONE TRIM PRESSURE REGULATOR	1	FESC, FAR AFT UPPER RIGHT HAND; 112AB	21-61-27
ZONE TRIM VALVE	5	FESC, FAR AFT UPPER RIGHT HAND; 112AB	21-61-07

*SEE WM EQUIPMENT LIST

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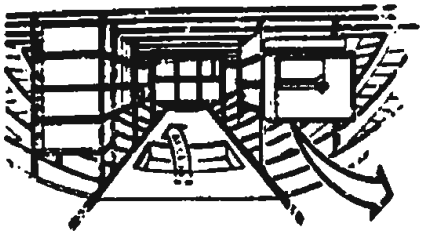
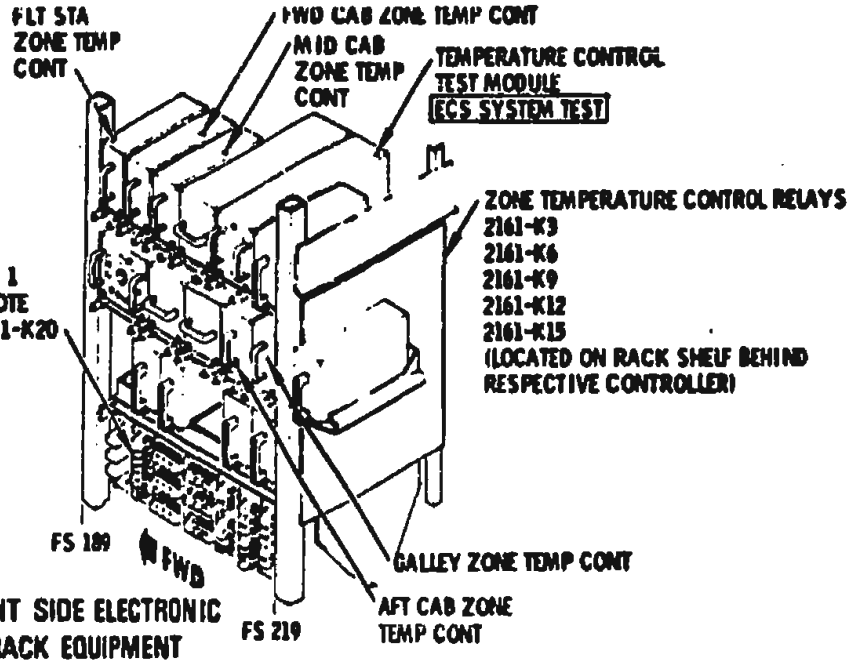
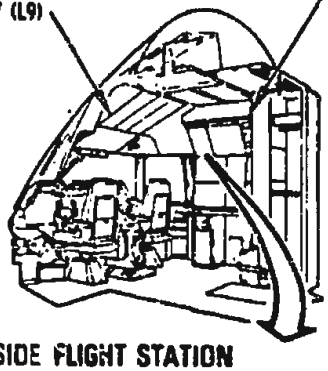


FORWARD ELECTRONIC SERVICE CENTER (LOOKING FORWARD)



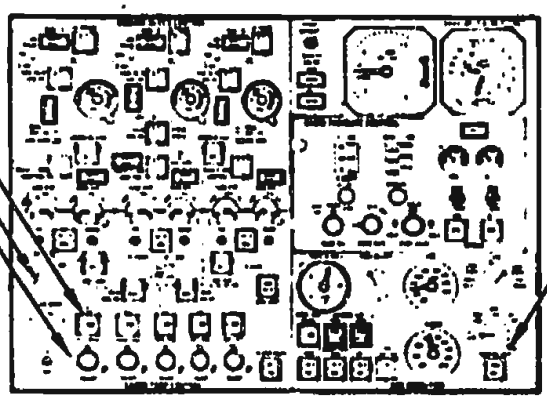
RIGHT SIDE ELECTRONIC RACK EQUIPMENT

CIRCUIT BREAKER PANEL NO. 1 (CB1)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1 (H3) (2121-CB1)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 2 (H4) (2121-CB3)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 3 (H5) (2121-CB4)
MISC - ANN RESET (L9)



RIGHT SIDE FLIGHT STATION

CIRCUIT BREAKER PANEL NO. 3 (CB3)
TEMP CONTROL FLT STA - DC (V3) (2160-CB1)
TEMP CONTROL FLT STA - AC (V4) (2160-CB8)
PACK 1 AUTOMAN - DC (V5) (2162-CB2)
PACK 1 AUTOMAN - AC (V6) (2162-CB1)
PACK 2 AUTOMAN - DC (V7) (2162-CB4)
PACK 2 AUTOMAN - AC (V8) (2162-CB3)
ZONE CENTER TEMPERATURE CONTROL FWD CAB - DC (V9) (2161-CB2)
ZONE CENTER TEMPERATURE CONTROL FWD CAB - AC (V10) (2160-CB9)
ZONE CENTER TEMPERATURE CONTROL MID CAB - DC (V11) (2161-CB3)
ZONE CENTER TEMPERATURE CONTROL MID CAB - AC (V12) (2160-CB10)
ZONE CENTER TEMPERATURE CONTROL AFT CAB - DC (V13) (2161-CB4)
ZONE CENTER TEMPERATURE CONTROL AFT CAB - AC (V14) (2160-CB11)
ZONE CENTER TEMPERATURE CONTROL GALLEY - DC (V15) (2161-CB5)
ZONE CENTER TEMPERATURE CONTROL GALLEY - AC (V16) (2160-CB12)
PACK 3 AUTOMAN DC (V17) (2162-CB6)
PACK 3 AUTOMAN AC (V18) (2162-CB7)



FLIGHT ENGINEER/SECOND OFFICERS UPPER PANEL

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R R Component Locator Diagram
Figure 102 (Sheet 1)

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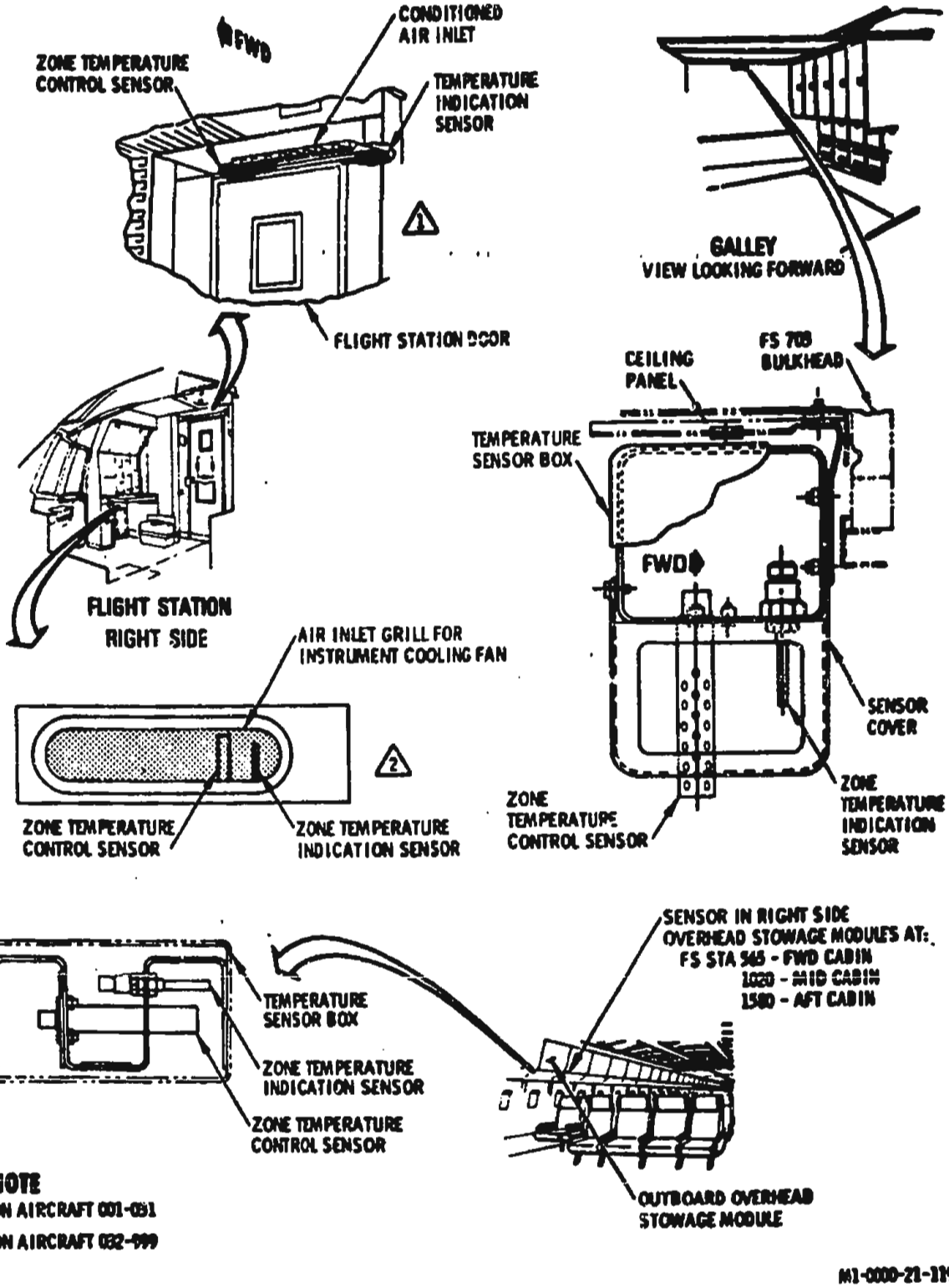

R Component Locator Diagram
R Figure 102 (Sheet 2)

R EFFECTIVITY: ALL

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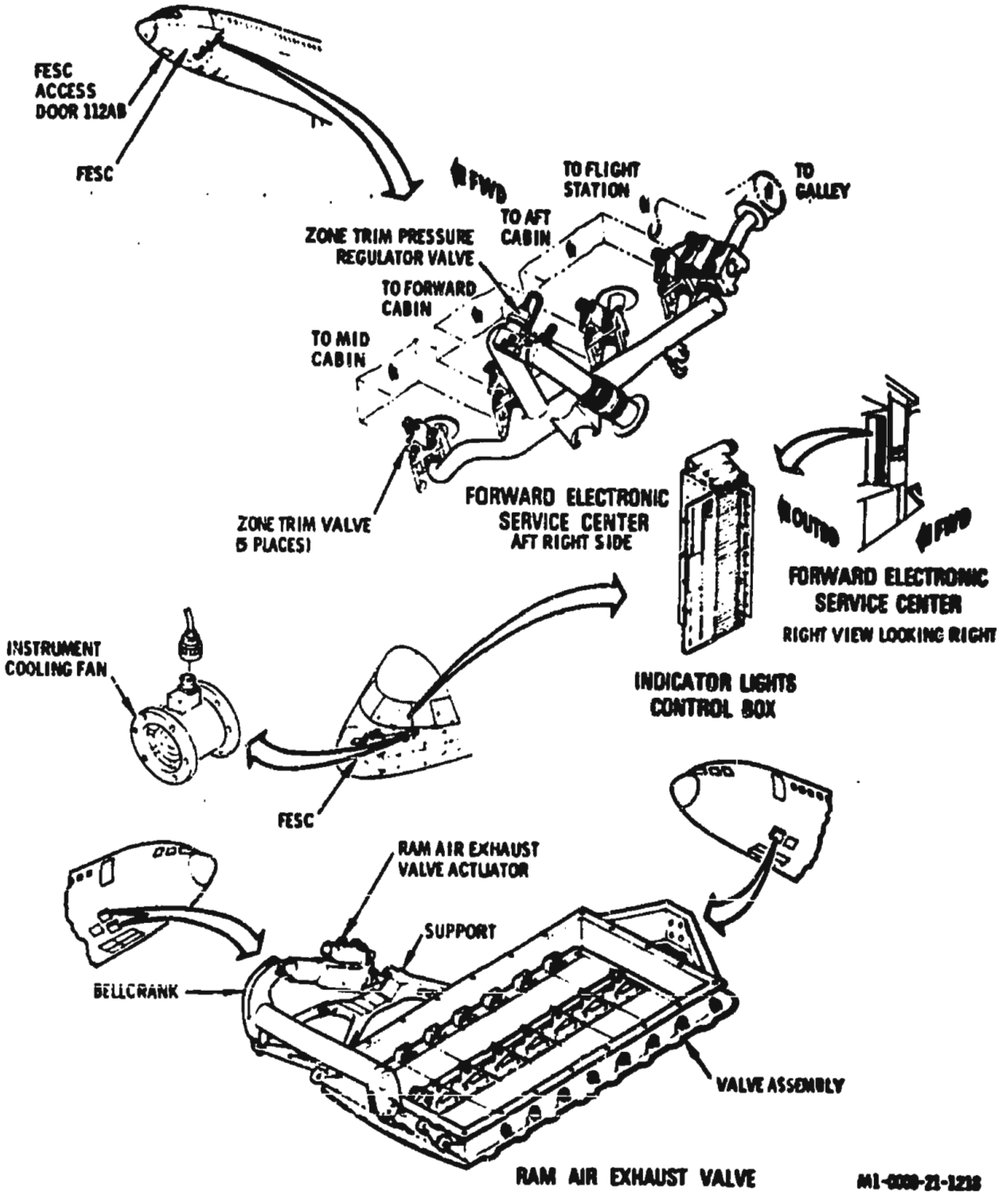
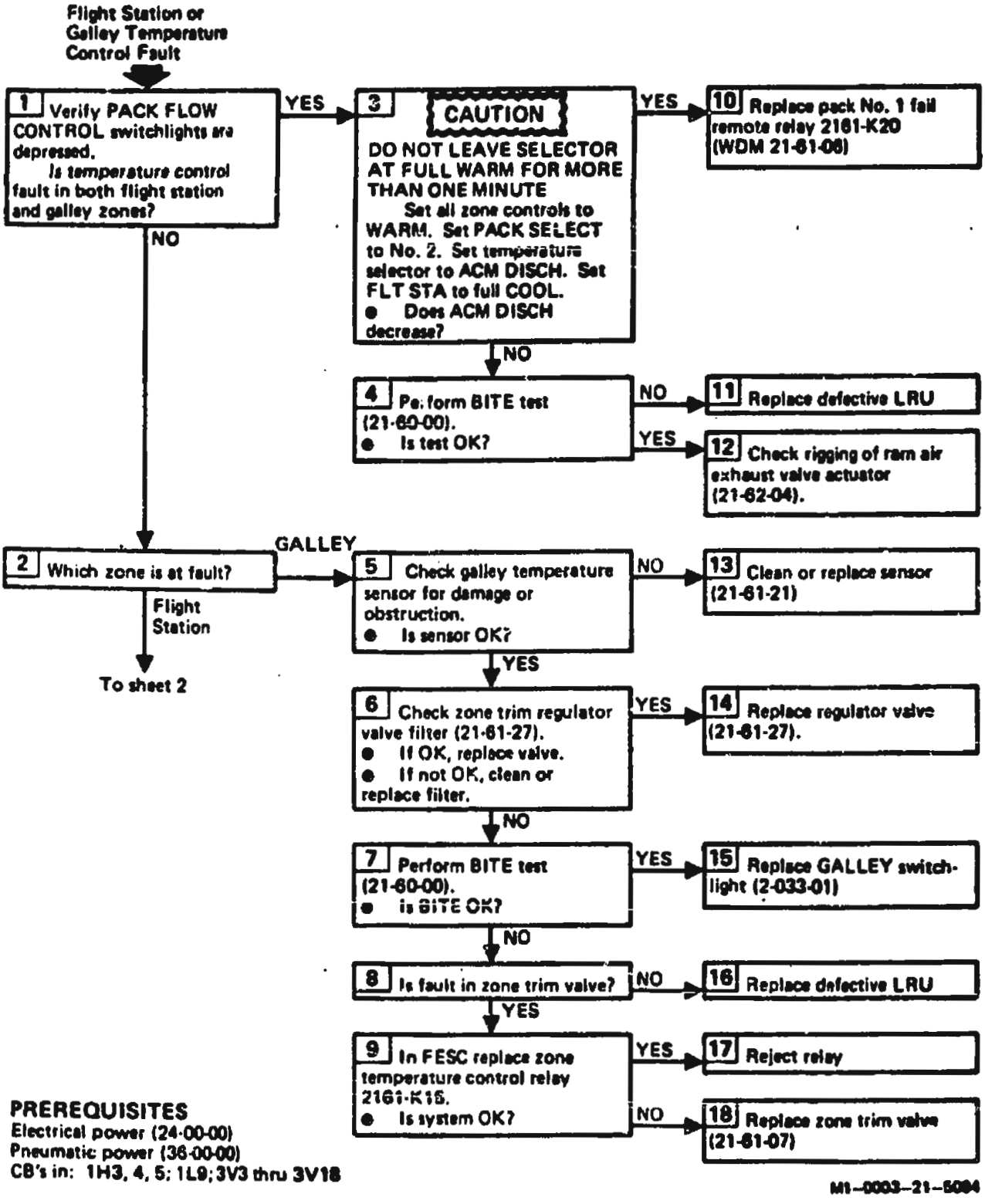
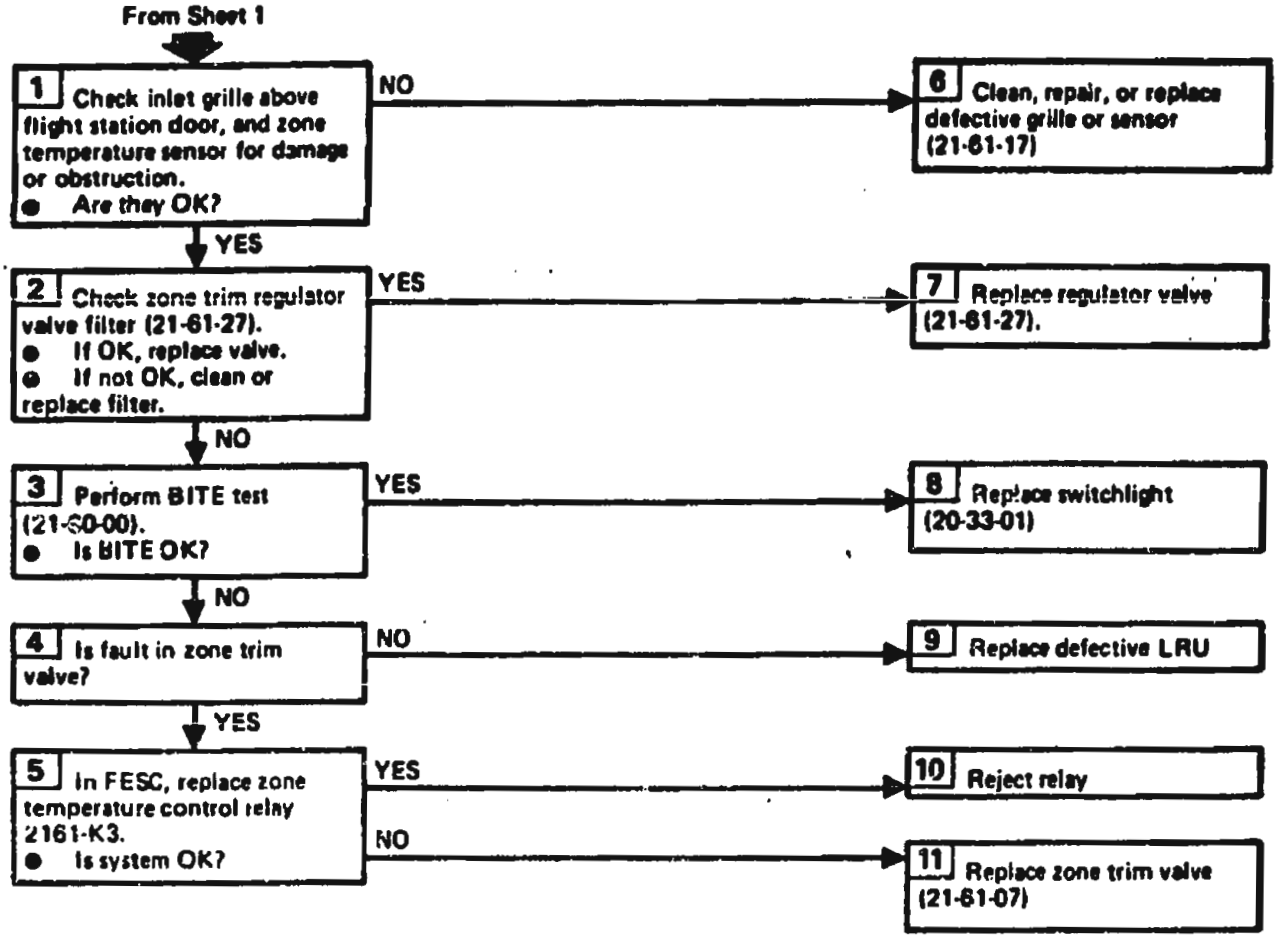


R Component Locator Diagram
R Figure 102 (Sheet 3)


Flight Station or Galley Temperature Control Fault
1 Verify PACK FLOW CONTROL switchlights are depressed.
Is temperature control fault in both flight station and galley zones?
YES
NO
3 CAUTION
DO NOT LEAVE SELECTOR AT FULL WARM FOR MORE THAN ONE MINUTE
Set all zone controls to WARM. Set PACK SELECT to No. 2. Set temperature selector to ACM DISCH. Set FLT STA to full COOL.
● Does ACM DISCH decrease?
YES
10 Replace pack No. 1 fail remote relay 2161-K20 (WDM 21-61-06)
NO
4 Perform BITE test (21-60-00).
● Is test OK?
NO
11 Replace defective LRU
YES
12 Check rigging of ram air exhaust valve actuator (21-62-04).
2 Which zone is at fault?
GALLEY
Flight Station
To sheet 2
5 Check galley temperature sensor for damage or obstruction.
● Is sensor OK?
NO
13 Clean or replace sensor (21-61-21)
YES
6 Check zone trim regulator valve filter (21-61-27).
● If OK, replace valve.
● If not OK, clean or replace filter.
YES
14 Replace regulator valve (21-61-27).
NO
7 Perform BITE test (21-60-00).
● Is BITE OK?
YES
15 Replace GALLEY switchlight (2-033-01)
NO
8 Is fault in zone trim valve?
NO
16 Replace defective LRU
YES
9 In FESC replace zone temperature control relay 2161-K15.
● Is system OK?
YES
17 Reject relay
NO
18 Replace zone trim valve (21-61-07)
PREREQUISITES
Electrical power (24-00-00)
Pneumatic power (36-00-00)
CB's in: 1H3, 4, 5; 1L9; 3V3 thru 3V18
M1-0003-21-5094

R R Flight Station or Galley Zone Temperature Control Fault
Figure 103 (Sheet 1)

R R EFFECTIVITY: ALL

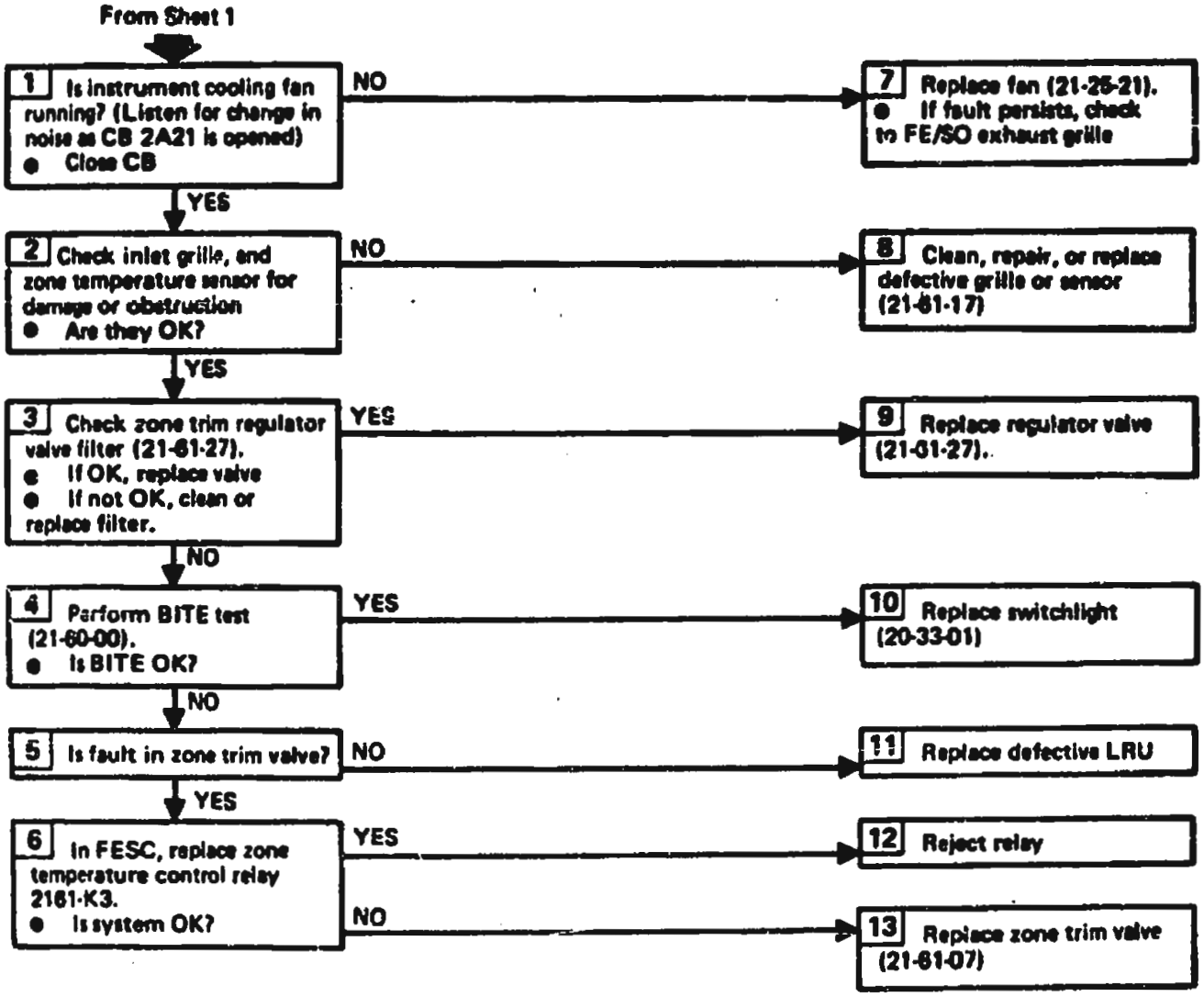

From Sheet 1
1 Check inlet grille above flight station door, and zone temperature sensor for damage or obstruction.
● Are they OK?
NO
6 Clean, repair, or replace defective grille or sensor (21-61-17)
YES
2 Check zone trim regulator valve filter (21-61-27).
● If OK, replace valve.
● If not OK, clean or replace filter.
YES
7 Replace regulator valve (21-61-27).
NO
3 Perform BITE test (21-60-00).
● Is BITE OK?
YES
8 Replace switchlight (20-33-01)
NO
4 Is fault in zone trim valve?
NO
9 Replace defective LRU
YES
5 In FESC, replace zone temperature control relay 2161-K3.
● Is system OK?
YES
10 Reject relay
NO
11 Replace zone trim valve (21-61-07)

PREREQUISITES
Electrical Power (24-00-00)
Pneumatic Power (36-00-00)
CB's in: 1H3, 4, 5; 3V3 thru 3V18

M1-0001-21-6087

R Flight Station or Galley Zone Temperature Control Fault
R Figure 103 (Sheet 2)

R EFFECTIVITY: 001-020 WITHOUT SB21-050
R
001B

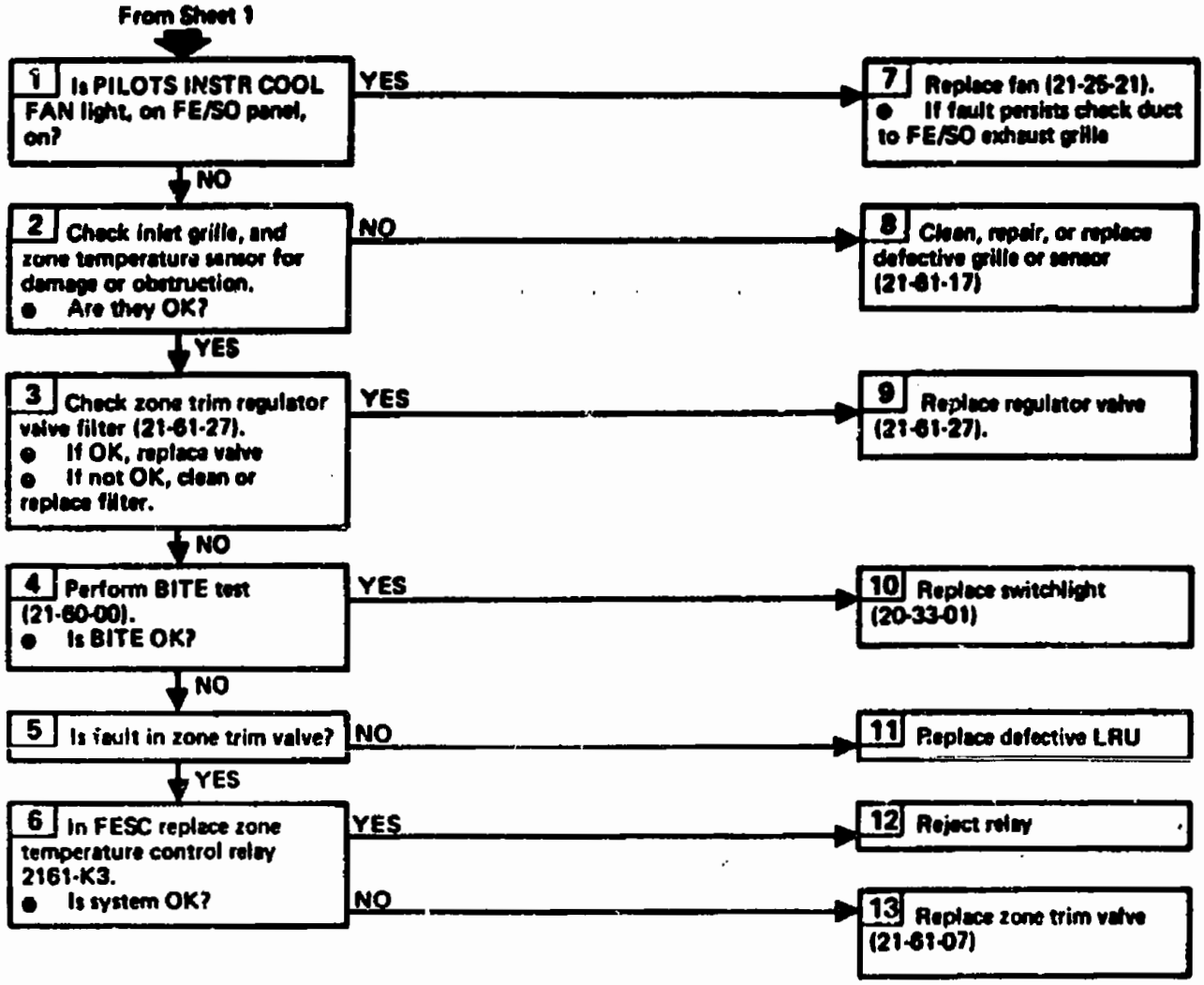

From Sheet 1
1 Is instrument cooling fan running? (Listen for change in noise as CB 2A21 is opened)
• Close CB
NO
7 Replace fan (21-26-21).
• If fault persists, check fo FE/SO exhaust grille
YES
2 Check inlet grille, and zone temperature sensor for damage or obstruction
• Are they OK?
NO
8 Clean, repair, or replace defective grille or sensor (21-61-17)
YES
3 Check zone trim regulator valve filter (21-61-27).
• If OK, replace valve
• If not OK, clean or replace filter.
YES
9 Replace regulator valve (21-61-27).
NO
4 Perform BITE test (21-60-00).
• Is BITE OK?
YES
10 Replace switchlight (20-33-01)
NO
5 Is fault in zone trim valve?
NO
11 Replace defective LRU
YES
6 In FESC, replace zone temperature control relay 2161-K3.
• Is system OK?
YES
12 Reject relay
NO
13 Replace zone trim valve (21-61-07)

PREREQUISITES
Electrical Power (24-00-00)
Pneumatic Power (36-00-00),
CB's in 1H3, 4, 5; 3V3 thru 3V18

M1-0101-21-5088

R
R
R Flight Station or Galley Zone Temperature Control Fault
Figure 103 (Sheet 2)

R EFFECTIVITY: 001-020 WITH SB21-050, AND
R 001-999 WITHOUT SB21-123
001B

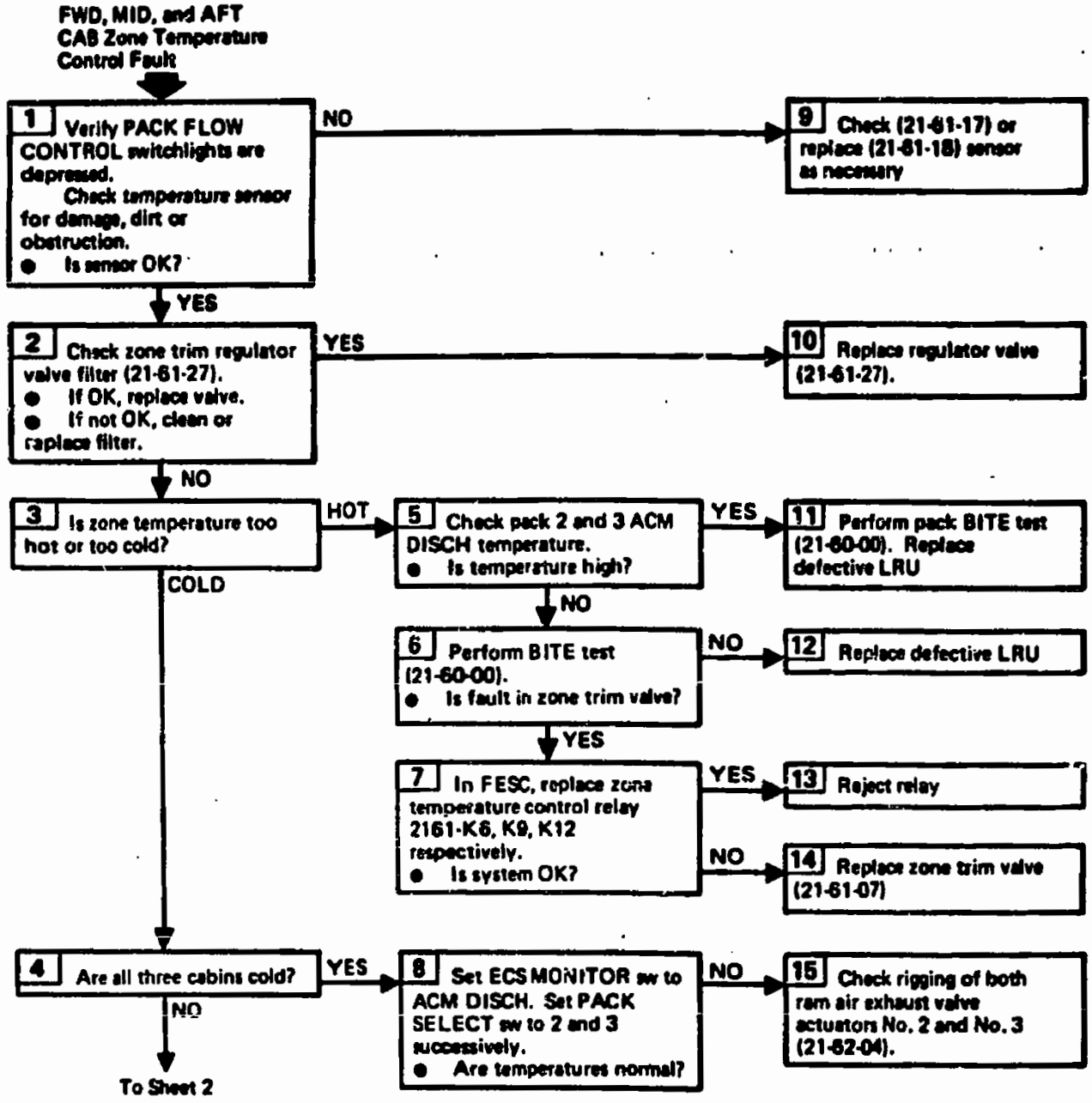

From Sheet 1
1 Is PILOTS INSTR COOL FAN light, on FE/SO panel, on?
YES
7 Replace fan (21-25-21).
● If fault persists check duct to FE/SO exhaust grille
NO
2 Check inlet grille, and zone temperature sensor for damage or obstruction.
● Are they OK?
NO
8 Clean, repair, or replace defective grille or sensor (21-61-17)
YES
3 Check zone trim regulator valve filter (21-61-27).
● If OK, replace valve
● If not OK, clean or replace filter.
YES
9 Replace regulator valve (21-61-27).
NO
4 Perform BITE test (21-60-00).
● Is BITE OK?
YES
10 Replace switchlight (20-33-01)
NO
5 Is fault in zone trim valve?
NO
11 Replace defective LRU
YES
6 In FESC replace zone temperature control relay 2161-K3.
● Is system OK?
YES
12 Reject relay
NO
13 Replace zone trim valve (21-61-07)

PREREQUISITES
Electrical Power (24-00-00)
Pneumatic Power (36-00-00),
CB's in 1H3, 4, 5; 3V3 thru 3V16

M1-0101-21-5089

R Flight Station or Galley Zone Temperature Control Fault
R Figure 103 (Sheet 2)

R EFFECTIVITY: WITH SB21-123
R
001B

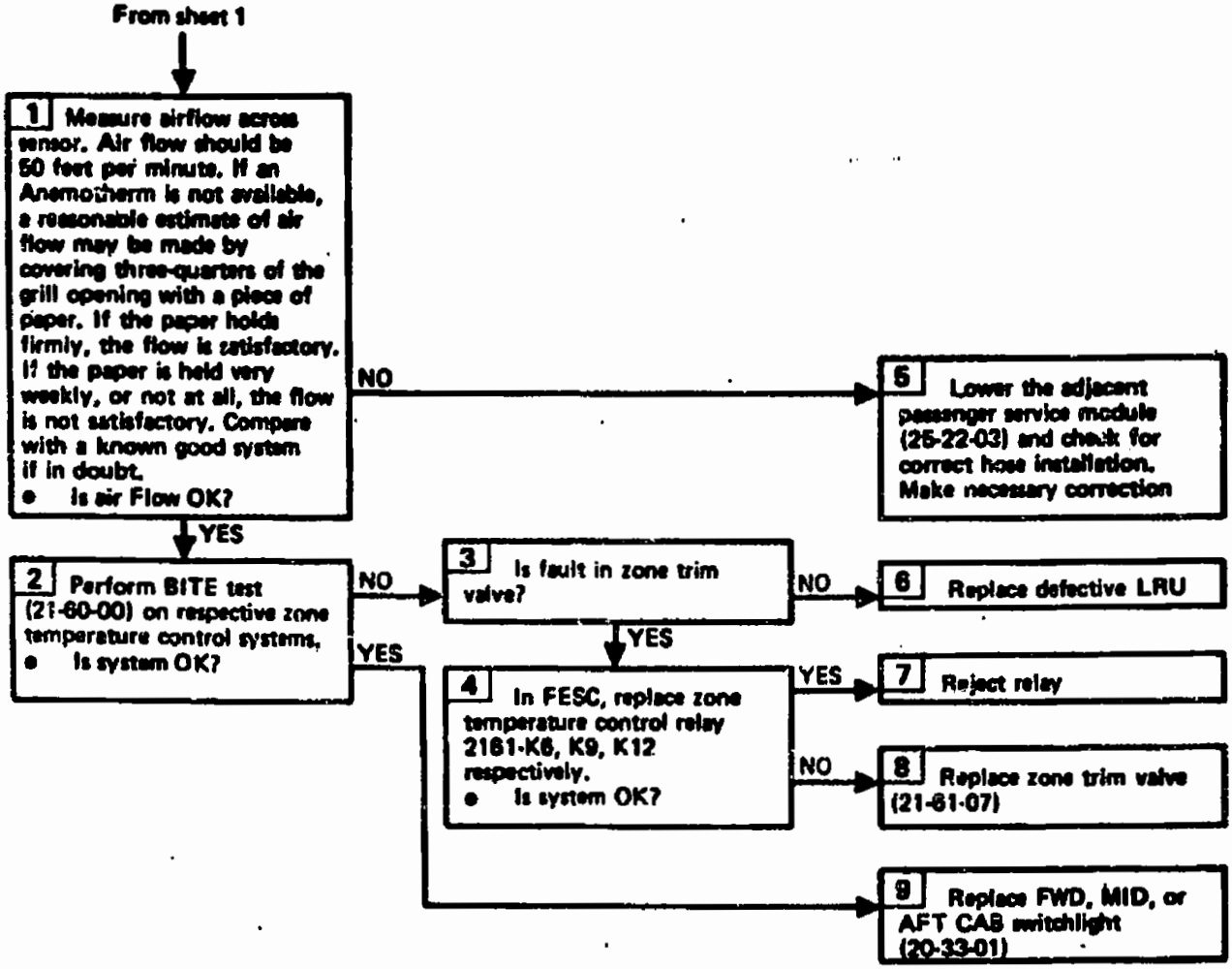

FWD, MID, and AFT CAB Zone Temperature Control Fault
1 Verify PACK FLOW CONTROL switchlights are depressed. Check temperature sensor for damage, dirt or obstruction. ● Is sensor OK?
NO
9 Check (21-61-17) or replace (21-61-18) sensor as necessary
YES
2 Check zone trim regulator valve filter (21-61-27). ● If OK, replace valve. ● If not OK, clean or replace filter.
YES
10 Replace regulator valve (21-61-27).
NO
3 Is zone temperature too hot or too cold?
HOT
5 Check pack 2 and 3 ACM DISCH temperature. ● Is temperature high?
YES
11 Perform pack BITE test (21-60-00). Replace defective LRU
NO
6 Perform BITE test (21-60-00). ● Is fault in zone trim valve?
NO
12 Replace defective LRU
YES
7 In FESC, replace zone temperature control relay 2161-K6, K9, K12 respectively. ● Is system OK?
YES
13 Reject relay
NO
14 Replace zone trim valve (21-61-07)
COLD
4 Are all three cabins cold?
YES
8 Set ECS MONITOR sw to ACM DISCH. Set PACK SELECT sw to 2 and 3 successively. ● Are temperatures normal?
NO
15 Check rigging of both ram air exhaust valve actuators No. 2 and No. 3 (21-62-04).
NO
To Sheet 2

PREREQUISITES
ELECTRICAL POWER (24-00-00)
PNEUMATIC POWER (36-00-00)
CB's in: 1H3, 4, 5, IL9; 3V3 thru 3V18

M1-0101-21-6122

R R Forward, Mid, or Aft Cabin Zone Temperature Control Fault
Figure 104 (Sheet 1)

R R 001B EFFECTIVITY: ALL

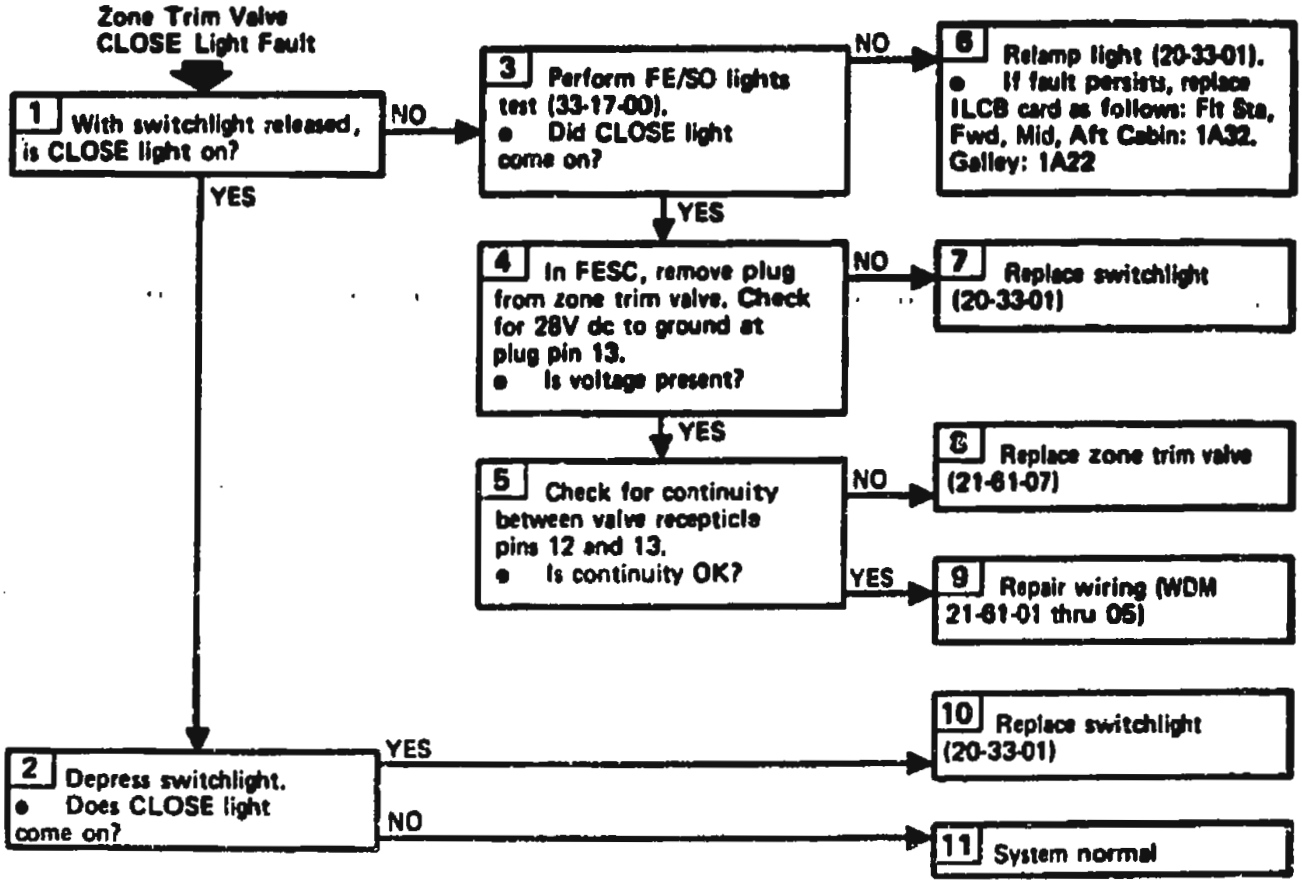

From sheet 1
1 Measure airflow across sensor. Air flow should be 50 feet per minute. If an Anemotherm is not available, a reasonable estimate of air flow may be made by covering three-quarters of the grill opening with a piece of paper. If the paper holds firmly, the flow is satisfactory. If the paper is held very weakly, or not at all, the flow is not satisfactory. Compare with a known good system if in doubt.
• Is air Flow OK?
NO
5 Lower the adjacent passenger service module (25-22-03) and check for correct hose installation. Make necessary correction
YES
2 Perform BITE test (21-60-00) on respective zone temperature control systems.
• Is system OK?
NO
3 Is fault in zone trim valve?
NO
6 Replace defective LRU
YES
YES
4 In FESC, replace zone temperature control relay 2181-K6, K9, K12 respectively.
• Is system OK?
YES
7 Reject relay
NO
8 Replace zone trim valve (21-61-07)
9 Replace FWD, MID, or AFT CAB switchlight (20-33-01)

PREREQUISITES
Elec Pwr (24-00-00)
CB's in: 1H3, 4, 5; 1L9; 3V3 thru 18

M1-0101-21-8082

R Forward, Mid, or Aft Cabin Zone Temperature Control Fault
R Figure 104 (Sheet 2)

R EFFECTIVITY: ALL
R
001B


Zone Trim Valve CLOSE Light Fault
1 With switchlight released, is CLOSE light on?
NO
YES
3 Perform FE/SO lights test (33-17-00).
• Did CLOSE light come on?
NO
YES
6 Relamp light (20-33-01).
• If fault persists, replace ILCB card as follows: Flt Sta, Fwd, Mid, Aft Cabin: 1A32. Galley: 1A22
4 In FESC, remove plug from zone trim valve. Check for 28V dc to ground at plug pin 13.
• Is voltage present?
NO
YES
7 Replace switchlight (20-33-01)
5 Check for continuity between valve recepticle pins 12 and 13.
• Is continuity OK?
NO
YES
8 Replace zone trim valve (21-61-07)
9 Repair wiring (WDM 21-61-01 thru 05)
2 Depress switchlight.
• Does CLOSE light come on?
YES
NO
10 Replace switchlight (20-33-01)
11 System normal

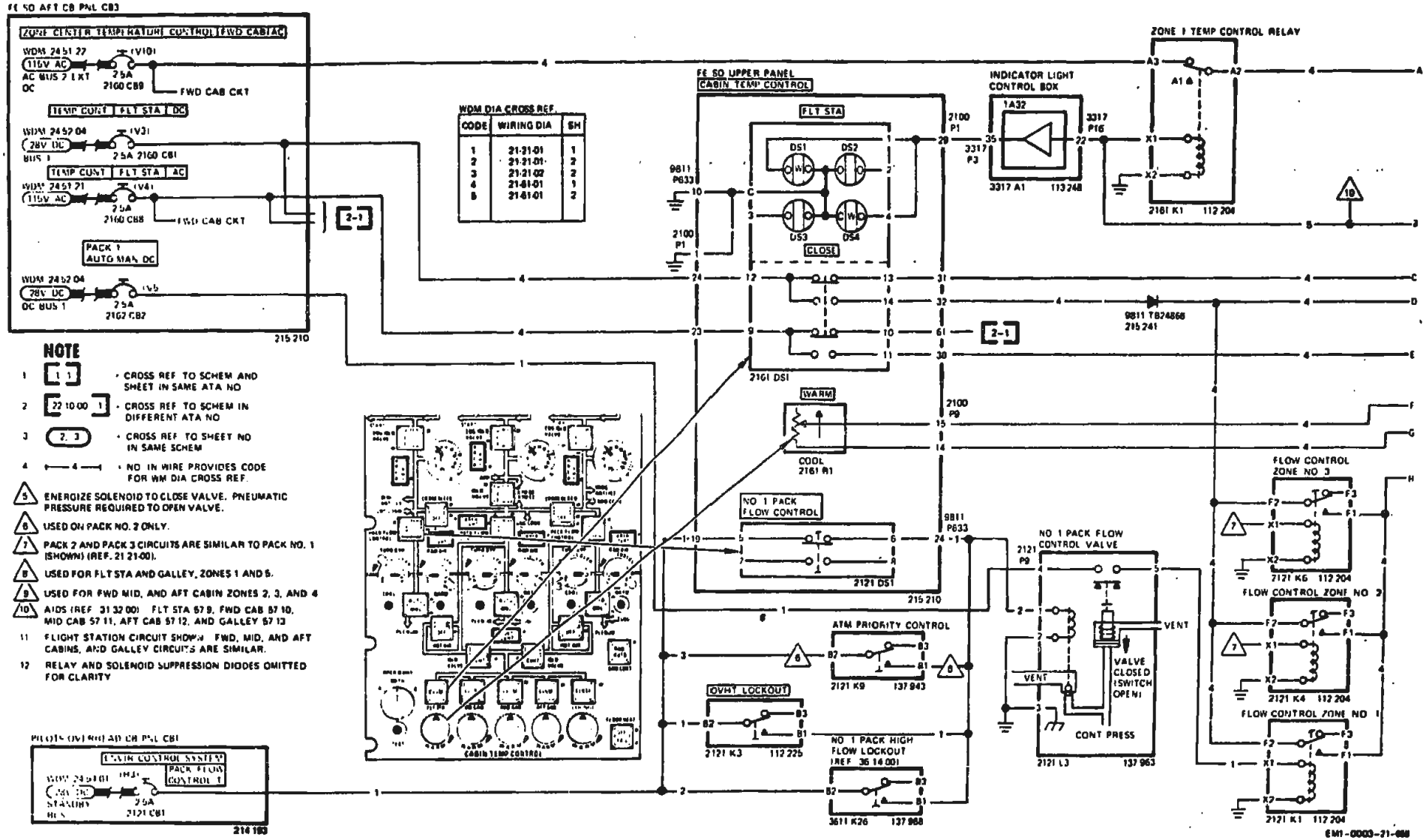
PREREQUISITES
Elec Pwr (24-00-00)
Pneumatic Pwr (33-00-00)
CB's in 1H3, 4, 5; 1L9; 3V3 thru 18

M1-0100-21-5091

R R Zone Trim Valve CLOSE Light Fault
Figure 105

EFFECTIVITY: ALL

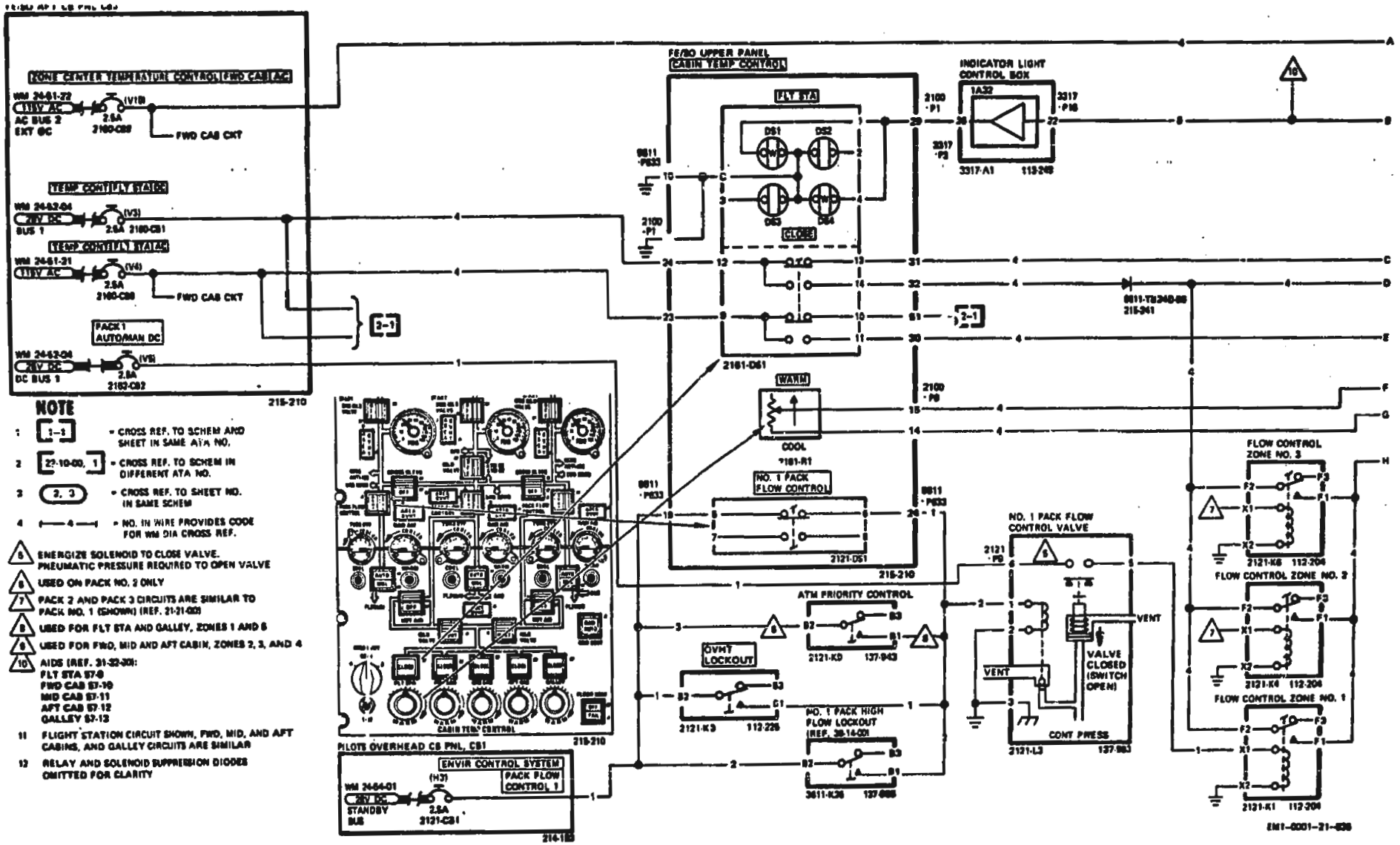
0018


FE SO AFT CB PNL CB3
ZONE CENTER TEMPERATURE CONTROL FWD CAB/AC
WDM 2451 22
115V AC
AC BUS 2 EXT
DC
25A
2160 CB9
FWD CAB CKT
TEMP CONT
FLT STA
DC
WDM 2452 04
28V DC
BUS 1
25A 2160 CB1
TEMP CONT
FLT STA
AC
WDM 2451 21
115V AC
25A
2160 CB8
FWD CAB CKT
PACK 1
AUTO MAN DC
WDM 2452 04
28V DC
DC BUS 1
25A
2162 CB2
215 210
NOTE
1 [1] · CROSS REF TO SCHEM AND SHEET IN SAME ATA NO
2 [22 10 00 1] · CROSS REF TO SCHEM IN DIFFERENT ATA NO
3 (2, 3) · CROSS REF TO SHEET NO IN SAME SCHEM
4 —4— · NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 ENERGIZE SOLENOID TO CLOSE VALVE. PNEUMATIC PRESSURE REQUIRED TO OPEN VALVE.
6 USED ON PACK NO. 2 ONLY.
7 PACK 2 AND PACK 3 CIRCUITS ARE SIMILAR TO PACK NO. 1 (SHOWN) (REF. 21 21-00).
8 USED FOR FLT STA AND GALLEY, ZONES 1 AND 5.
9 USED FOR FWD MID, AND AFT CABIN ZONES 2, 3, AND 4
10 AIDS (REF. 31 32 00) FLT STA 57 9, FWD CAB 57 10, MID CAB 57 11, AFT CAB 57 12, AND GALLEY 57 13
11 FLIGHT STATION CIRCUIT SHOWN FWD, MID, AND AFT CABINS, AND GALLEY CIRCUITS ARE SIMILAR.
12 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
WDM DIA CROSS REF.
CODE WIRING DIA SH
1 21-21-01 1
2 21-21-01 2
3 21-21-02 2
4 21-61-01 1
5 21-61-01 2
FE SO UPPER PANEL
CABIN TEMP CONTROL
FLT STA
DS1 DS2
DS3 DS4
CLOSE
2161 DS1
WARM
COOL
2161 R1
NO 1 PACK FLOW CONTROL
2121 DS1
215 210
ZONE 1 TEMP CONTROL RELAY
INDICATOR LIGHT CONTROL BOX
1A32
3317 A1
113 248
2161 K1 112 204
9811 TB24866
215 241
NO 1 PACK FLOW CONTROL VALVE
2121 L3 137 963
VALVE CLOSED (SWITCH OPEN)
CONT PRESS
VENT
ATM PRIORITY CONTROL
2121 K9 137 943
OVHT LOCKOUT
2121 K3 112 225
NO 1 PACK HIGH FLOW LOCKOUT (REF. 36 14 00)
3611 K26 137 968
FLOW CONTROL ZONE NO 3
2121 K6 112 204
FLOW CONTROL ZONE NO 2
2121 K4 112 204
FLOW CONTROL ZONE NO 1
2121 K1 112 204
CABIN TEMP CONTROL
PILOTS OVHD AFT CB PNL CB1
CABIN CONTROL SYSTEM
PACK FLOW CONTROL 1
25A
2121 CB1
214 183
EM1-0000-21-000

R Typical Zone Trim Control System Schematic
R SCHEM 1 (Sheet 1)

EFFECTIVITY: 001-018

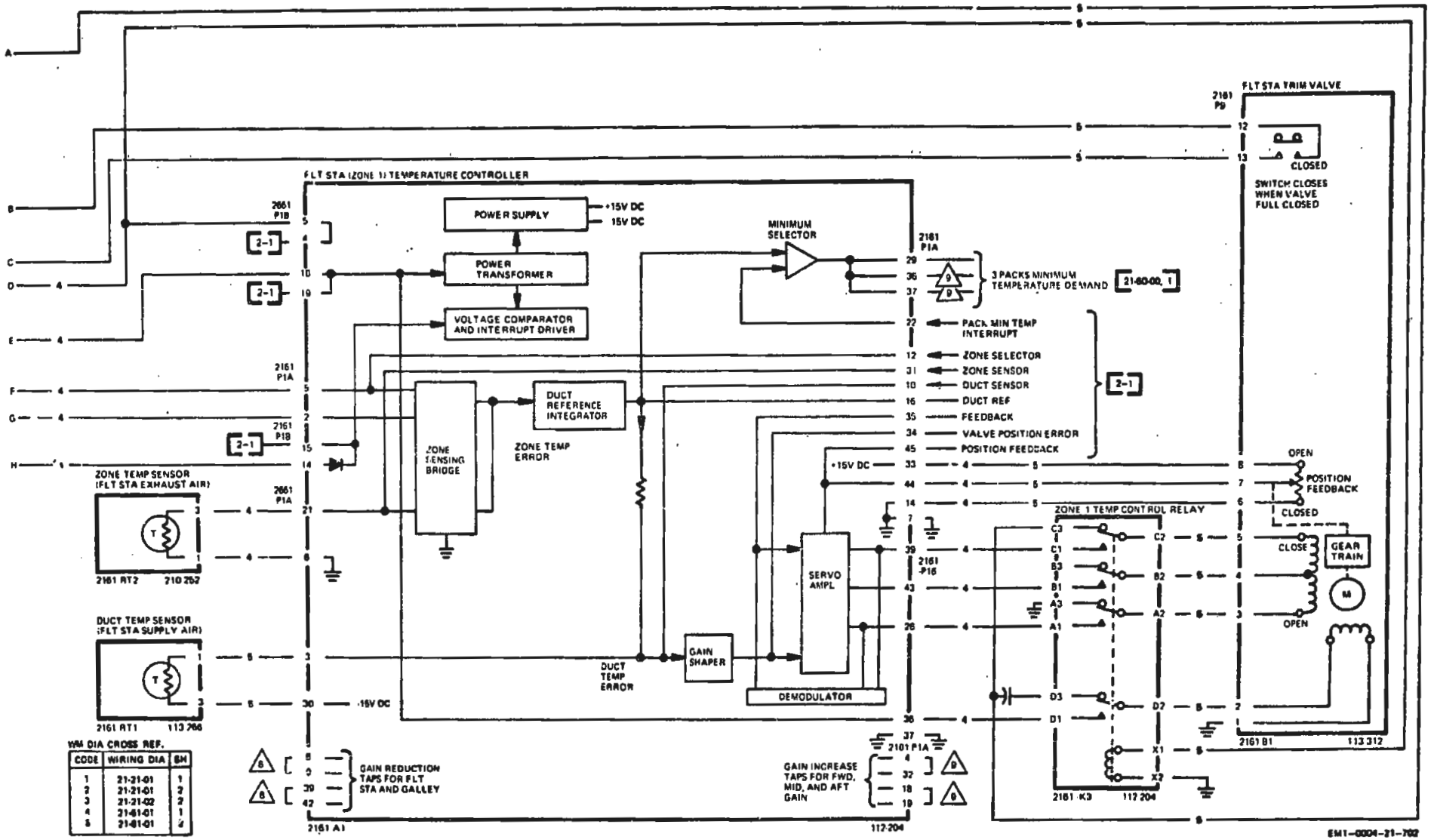
001B


ZONE CENTER TEMPERATURE CONTROL (FWD CAB) (AC)
TEMP CONT (FLT STATION)
TEMP CONT (FLT STA) (AC)
PACK 1 AUTO/MAN DC
FWD CAB CKT
215-210
NOTE
1 1-1 = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 22-10-00, 1 = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 2, 3 = CROSS REF. TO SHEET NO. IN SAME SCHEM
4 4 = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
6 ENERGIZE SOLENOID TO CLOSE VALVE. PNEUMATIC PRESSURE REQUIRED TO OPEN VALVE
6 USED ON PACK NO. 2 ONLY
7 PACK 2 AND PACK 3 CIRCUITS ARE SIMILAR TO PACK NO. 1 (SHOWN) (REF. 21-21-00)
8 USED FOR FLT STA AND GALLEY, ZONES 1 AND 5
8 USED FOR FWD, MID AND AFT CABIN, ZONES 2, 3, AND 4
10 AIDS (REF. 31-32-00):
FLT STA S7-9
FWD CAB S7-10
MID CAB S7-11
AFT CAB S7-12
GALLEY S7-13
11 FLIGHT STATION CIRCUIT SHOWN, FWD, MID, AND AFT CABINS, AND GALLEY CIRCUITS ARE SIMILAR
12 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
FE/SO UPPER PANEL
CABIN TEMP CONTROL
FLT STA
DS1 DS2 DS3 DS4
CLOSE
2161-DS1
WARM
COOL
2161-R1
NO. 1 PACK FLOW CONTROL
2121-DS1
INDICATOR LIGHT CONTROL BOX
1A32
3317-A1
ATM PRIORITY CONTROL
2121-KD
OVHT LOCKOUT
2121-K3
NO. 1 PACK HIGH FLOW LOCKOUT
NO. 1 PACK FLOW CONTROL VALVE
VENT
VALVE CLOSED (SWITCH OPEN)
CONT PRESS
2121-L3
FLOW CONTROL ZONE NO. 3
FLOW CONTROL ZONE NO. 2
FLOW CONTROL ZONE NO. 1
2121-K6
2121-K4
2121-K1
PILOT OVERHEAD CB PNL, CB1
ENVIR CONTROL SYSTEM
PACK FLOW CONTROL 1
STANDBY BUS
2121-CB1
214-153

R R Typical Zone Trim Control System Schematic
SCHEM 1 (Sheet 1)

EFFECTIVITY: 019-999

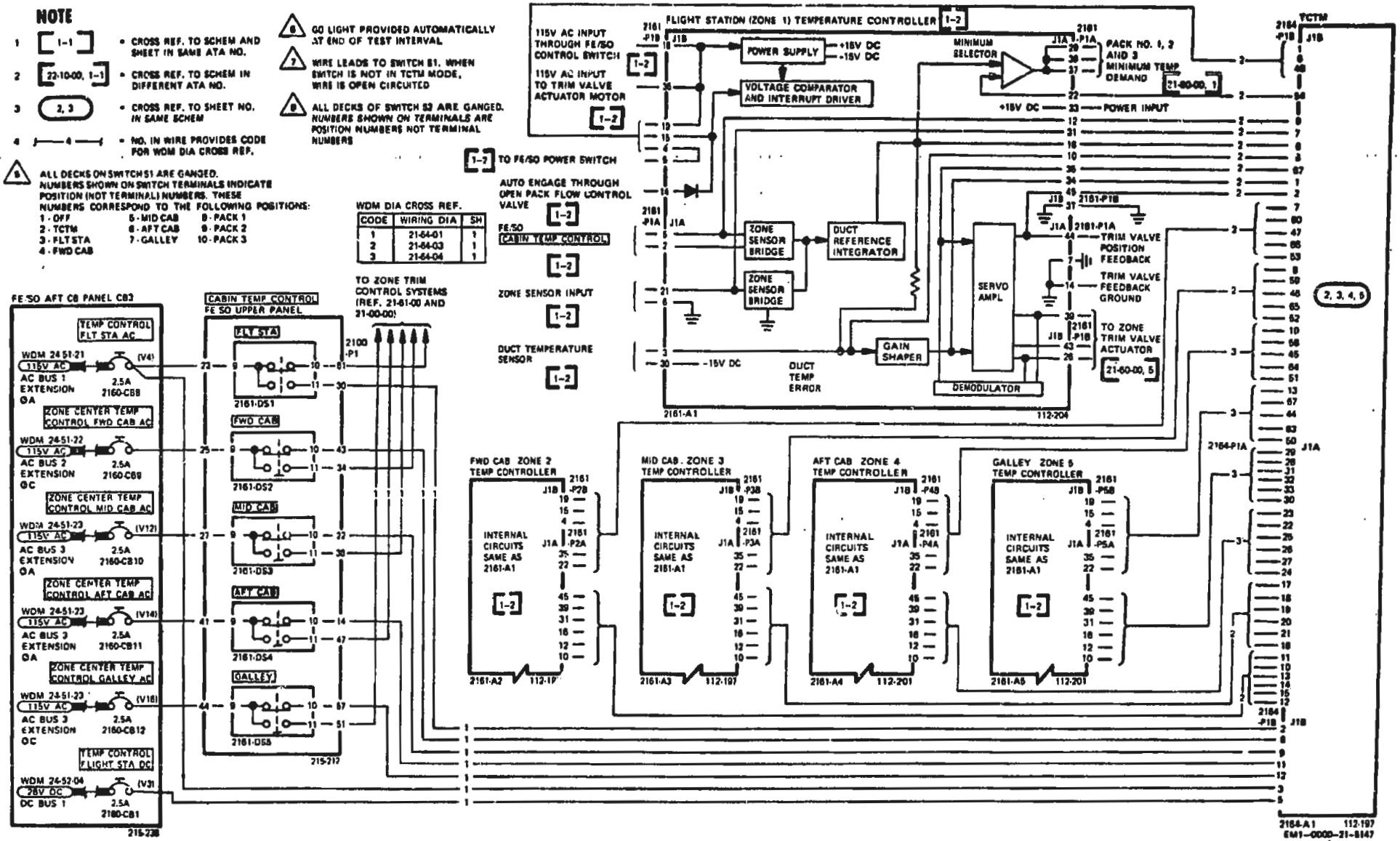
001B



R Typical Zone Trim Control System Schematic
R SCHEM 1 (Sheet 2)

EFFECTIVITY: ALL

001B


NOTE
1 [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00, 1-1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 —4— • NO. IN WIRE PROVIDES CODE FOR WDM DIA CROSS REF.
6 ALL DECKS ON SWITCH S1 ARE GANGED. NUMBERS SHOWN ON SWITCH TERMINALS INDICATE POSITION (NOT TERMINAL) NUMBERS. THESE NUMBERS CORRESPOND TO THE FOLLOWING POSITIONS:
1 - OFF 5 - MID CAB 9 - PACK 1
2 - TCTM 6 - AFT CAB 9 - PACK 2
3 - FLT STA 7 - GALLEY 10 - PACK 3
4 - FWD CAB
6 GO LIGHT PROVIDED AUTOMATICALLY AT END OF TEST INTERVAL
7 WIRE LEADS TO SWITCH S1, WHEN SWITCH IS NOT IN TCTM MODE, WIRE IS OPEN CIRCUITED
8 ALL DECKS OF SWITCH S2 ARE GANGED. NUMBERS SHOWN ON TERMINALS ARE POSITION NUMBERS NOT TERMINAL NUMBERS
WDM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 21-64-01 | 1
2 | 21-64-03 | 1
3 | 21-64-04 | 1
FE/SO AFT CB PANEL CB3
TEMP CONTROL FLT STA AC
WDM 24-51-21 115V AC (V4) AC BUS 1 EXTENSION 0A 2.5A 2160-CB8
ZONE CENTER TEMP CONTROL FWD CAB AC
WDM 24-51-22 115V AC AC BUS 2 EXTENSION 0C 2.5A 2160-CB9
ZONE CENTER TEMP CONTROL MID CAB AC
WDM 24-51-23 115V AC (V12) AC BUS 3 EXTENSION 0A 2.5A 2160-CB10
ZONE CENTER TEMP CONTROL AFT CAB AC
WDM 24-51-23 115V AC (V14) AC BUS 3 EXTENSION 0A 2.5A 2160-CB11
ZONE CENTER TEMP CONTROL GALLEY AC
WDM 24-51-23 115V AC (V16) AC BUS 3 EXTENSION 0C 2.5A 2160-CB12
TEMP CONTROL FLIGHT STA DC
WDM 24-52-04 28V DC (V3) DC BUS 1 2.5A 2160-CB1
215-238
CABIN TEMP CONTROL FE SO UPPER PANEL
FLT STA
2161-DS1
FWD CAB
2161-DS2
MID CAB
2161-DS3
AFT CAB
2161-DS4
GALLEY
2161-DS5
215-217
TO ZONE TRIM CONTROL SYSTEMS (REF. 21-61-00 AND 21-00-00)
2100 -P1
FLIGHT STATION (ZONE 1) TEMPERATURE CONTROLLER [1-2]
115V AC INPUT THROUGH FE/SO CONTROL SWITCH [1-2]
115V AC INPUT TO TRIM VALVE ACTUATOR MOTOR [1-2]
2161 -P1B J1B
POWER SUPPLY +15V DC -15V DC
VOLTAGE COMPARATOR AND INTERRUPT DRIVER
[1-2] TO FE/SO POWER SWITCH
AUTO ENGAGE THROUGH OPEN PACK FLOW CONTROL VALVE [1-2]
FE/SO CABIN TEMP CONTROL [1-2]
ZONE SENSOR INPUT [1-2]
DUCT TEMPERATURE SENSOR [1-2]
2161 -P1A J1A
ZONE SENSOR BRIDGE
ZONE SENSOR BRIDGE
DUCT REFERENCE INTEGRATOR
SERVO AMPL
GAIN SHAPER
DEMODULATOR
-15V DC
DUCT TEMP ERROR
2161-A1
112-204
MINIMUM SELECTOR
PACK NO. 1, 2 AND 3 MINIMUM TEMP DEMAND [21-60-00, 1]
+15V DC POWER INPUT
TRIM VALVE POSITION FEEDBACK
TRIM VALVE FEEDBACK GROUND
TO ZONE TRIM VALVE ACTUATOR [21-60-00, 5]
TCTM
2164 -P1B J1B
2164-P1A J1A
2164-A1 112-197
EM1-0000-21-8147
2, 3, 4, 5
FWD CAB ZONE 2 TEMP CONTROLLER
MID CAB. ZONE 3 TEMP CONTROLLER
AFT CAB ZONE 4 TEMP CONTROLLER
GALLEY ZONE 5 TEMP CONTROLLER
INTERNAL CIRCUITS SAME AS 2161-A1
2161-A2 112-197
2161-A3 112-197
2161-A4 112-201
2161-A5 112-201

Zone Trim Control Test Modes Schematic
SCHEM 2 (Sheet 1)

EFFECTIVITY: ALL

0018

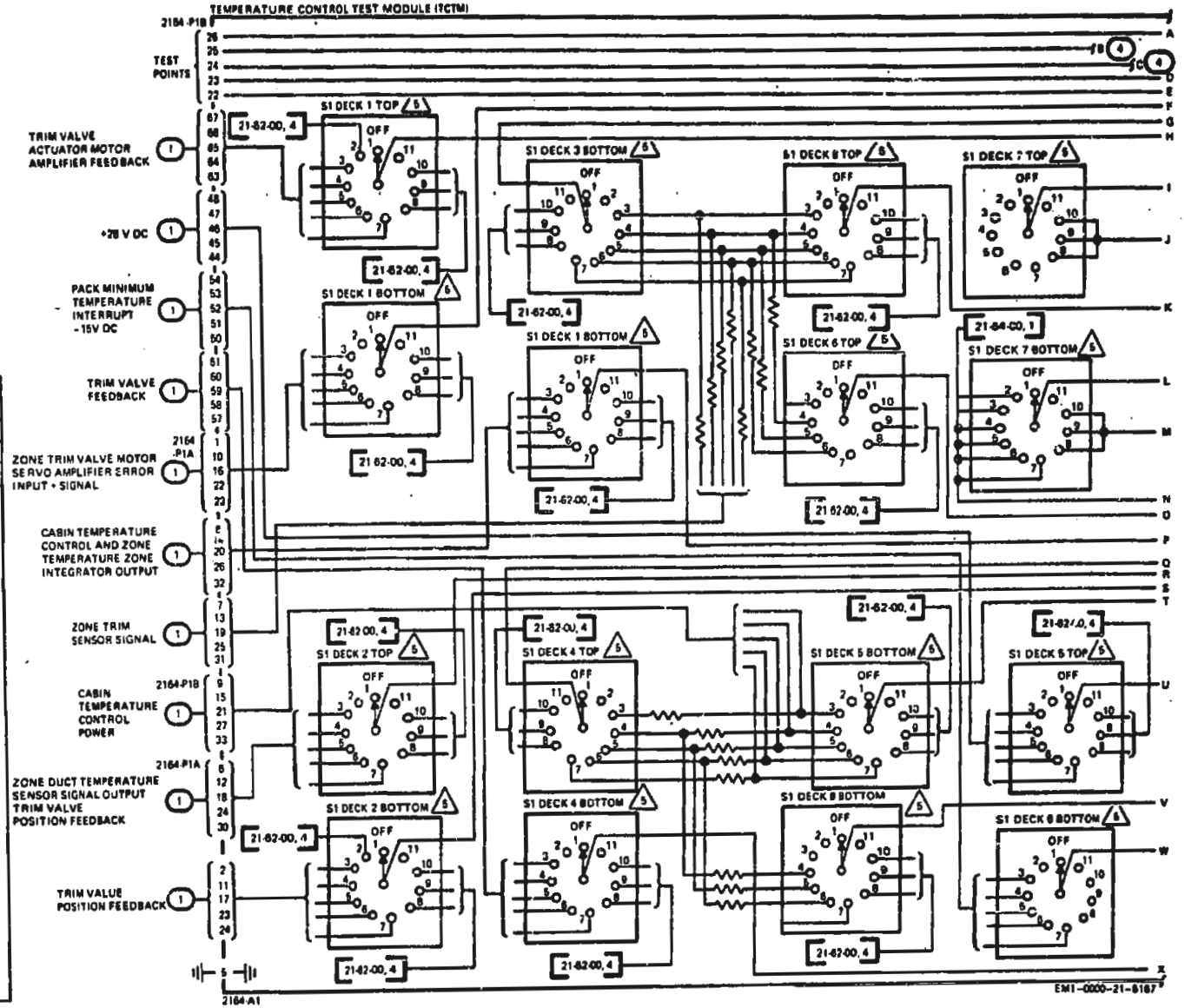
EFFECTIVITY

1 ON AIRCRAFT WITHOUT SB21 119

2 ON AIRCRAFT WITH SB21 119

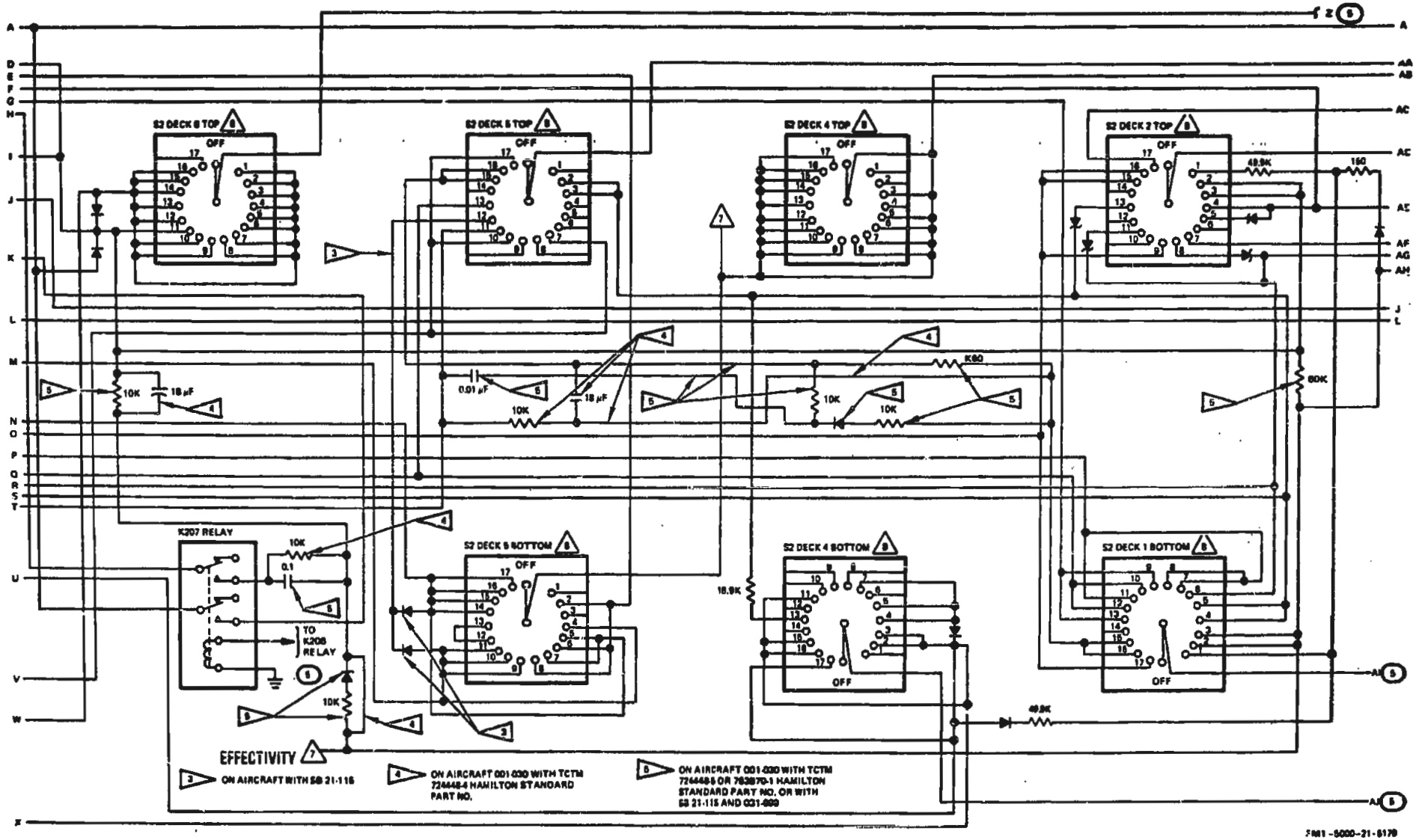
TABLE 1
SWITCH SELECTION AND FUNCTIONAL TEST

S2 POSITION	S1 POSITION: TCTM POSITION 2 (SELF TEST)	TIME DELAY (SEC)	ZONE POSITIONS 3 THRU 7 (ZONE CONTROLLERS TEST)	TIME DELAY (SEC)
1	NO GO LIGHT	4.8	MANUAL PUSH BUTTON	4.8
2	NO GO LIGHT	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6
3	6	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6
3	NO GO LIGHT	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6
4	NO GO LIGHT	47.0	ZONE TRIM VALVE POSITIONING	47.0
4	NO GO LIGHT	47.0	ZONE TRIM VALVE POSITIONING	47.0
5	6	24.6	6	24.6
6	6	4.8	ZONE DUCT SENSOR	4.8
7	6	24.6	6	24.6
8	6	4.8	DUCT ERROR TRACKING	4.8
9	6	24.6	ZONE SENSOR	24.6
10	6	4.8	ZONE SELECTOR	4.8
11	6	47.0	AUTO TRACKING	4.8
12	6	4.8	6	4.8
13	6	24.6	6	24.6
14	6	4.8	6	4.8
15	6	4.8	6	4.8
16	6		6	4.8
17	6	24.6	6	24.6



Zone Trim Control Test Modes Schematic
SCHEM 2 (Sheet 2)

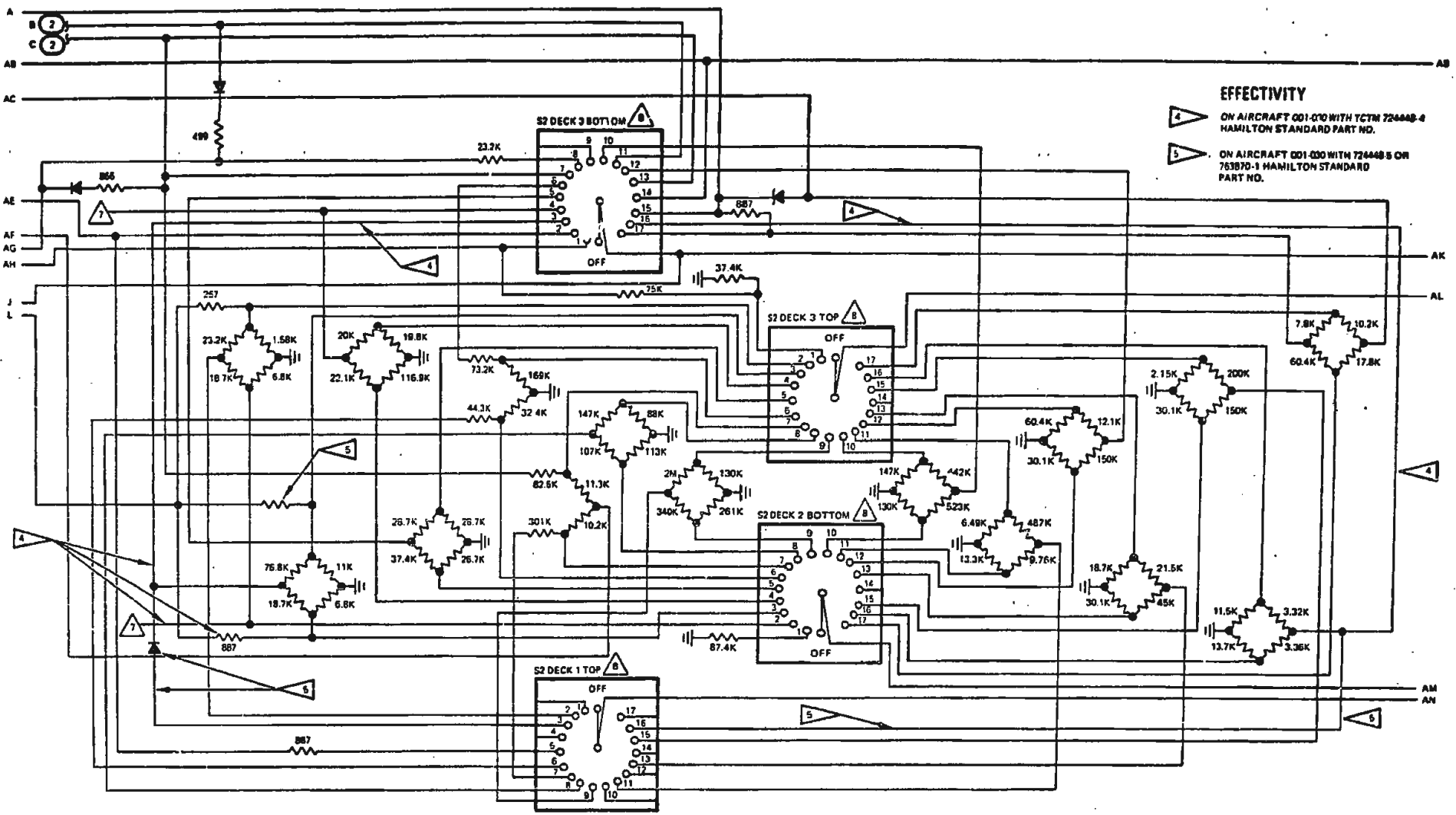
EFFECTIVITY: ALL



R Zone Trim Control Test Modes Schematic
R SCHEM 2 (Sheet 3)

EFFECTIVITY: ALL

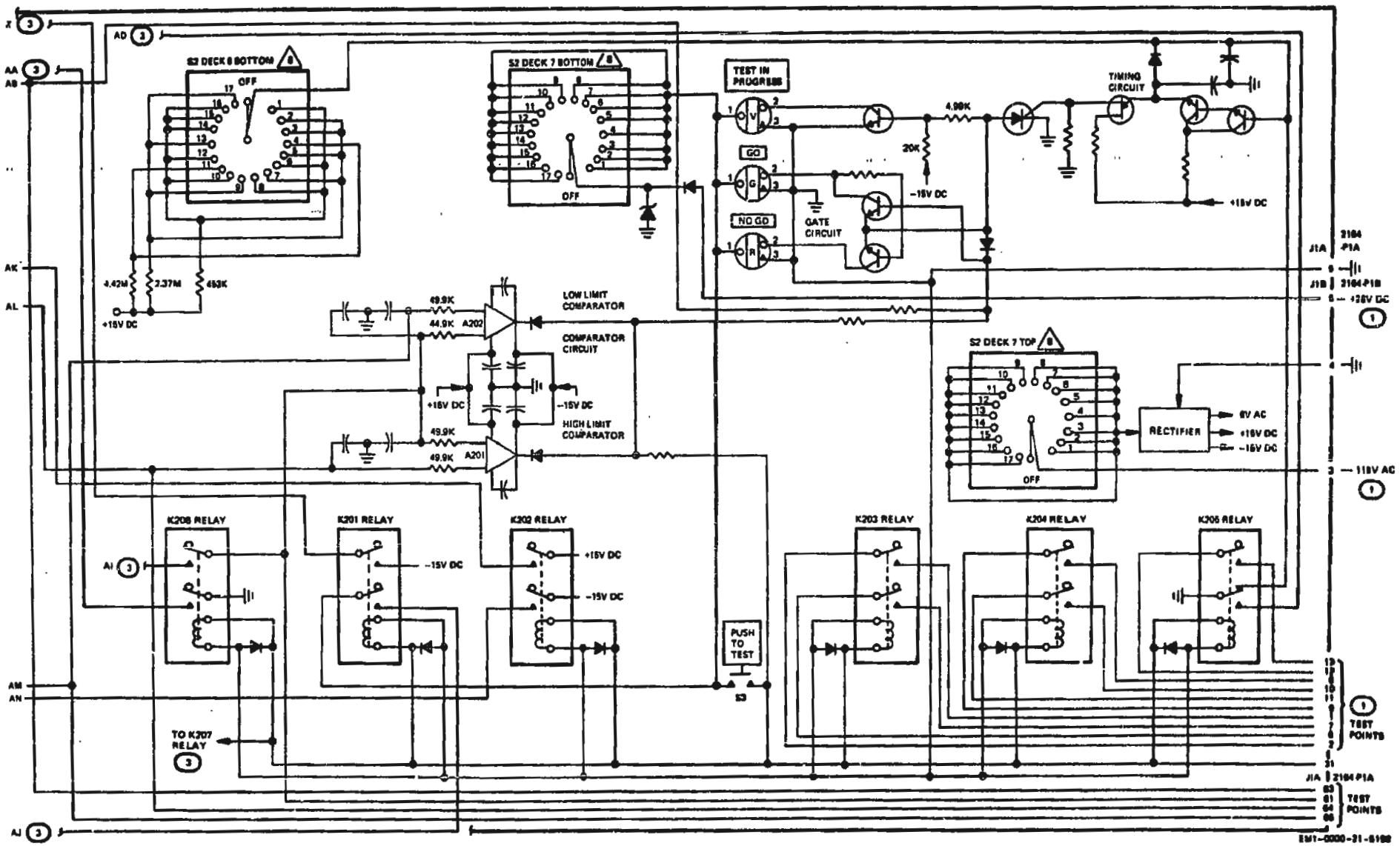
001B



R Zone Trim Control Test Modes Schematic
R SCHEM 2 (Sheet 4)

EFFECTIVITY: ALL

001B



Zone Trim Control Test Modes Schematic
SCHEM 2 (Sheet 5)

R
R

EFFECTIVITY: ALL

001B

ZONE TRIM TEMPERATURE SELECTOR - MAINTENANCE PRACTICES

1. General

The zone trim temperature selector is located on Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215.

2. Referenced Procedure

21-41-17	Hot Air Manifold Isolation Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices

3. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

ZONE TRIM TEMPERATURE CONTROLLER - MAINTENANCE PRACTICES

1. General

The zone trim control system has five air temperature controllers.

The deactivation procedure for each controller is identical except that different circuit breakers are affected. The title of each circuit breaker corresponds to the controller being deactivated. The controllers are located in the forward electronic service center (FESC) mounted on the right hand electrical rack. Access is through FESC access door 112AB.

2. Referenced Procedure

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices

3. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

ZONE TRIM CONTROL TEMPERATURE CONTROLLER REMOVAL AND INSTALLATION

1. General

The zone trim control system hasfive air temperature controllers (Ref. Fig. 401). The removal and installation procedure for each controller is identical except that different circuit breakers are affected. The title of each circuit breaker
R corresponds to the controller being removed and installed.

The controllers are located in the forward electronic service center (FESC) mounted on the right hand electrical rack.

2. Referenced Procedure

21-60-00 Temperature Control - Adjustment and Test

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breakers:

TEMP CONT - FLT STA - DC (V3),

TEMP CONT - FLT STA - AC (V4),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - DC (V9),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V11),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - AC (V12),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - DC (V13),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16)

(2) Gain access to FESC.

(3) Disengage holddown extractors and slide controller out of mounting rack (Ref. Fig. 401).

B. Installation

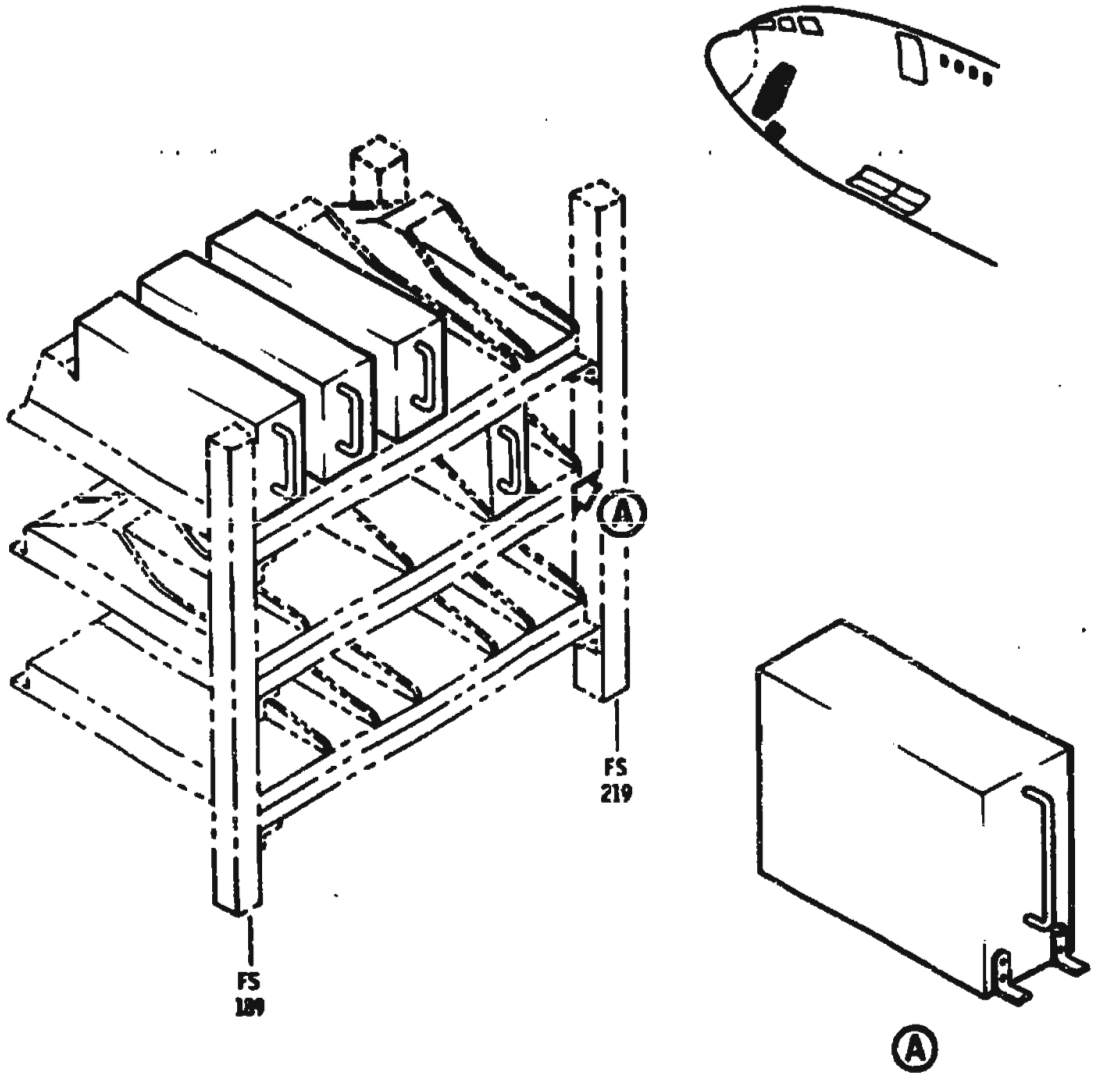
(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

(2) Slide controller into rack and press inward to engage electrical connector.

(3) Connect and tighten holddown extractors.

(4) Remove tags and close circuit breakers opened in Step 3A(1).

(5) Perform BITE test for pertinent zone trim system (Ref. 21-60-00).



M1-0101-21-221

Zone Trim Control Temperature Controller
Removal and Installation
Figure 401

ZONE TEMPERATURE CONTROLLER - ADJUSTMENT AND TEST

1. Adjustment/Test

The zone temperature controllers are not equipped with external adjustment points. The controllers can be tested with the temperature control system test module, (Ref. 21-60-00, Temperature Control - Adjustment and Test).

ZONE TRIM CONTROL VALVE - MAINTENANCE PRACTICES

1. General

All five zone trim control valves are in the aft right upper portion of the forward electronic service center (FESC), zone 113.

2. Referenced Procedure

21-41-17	Hot Air Manifold Isolation Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator Valve - Maintenance Practices

R 3. Maintenance Practices (Ref. Fig. 201)

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

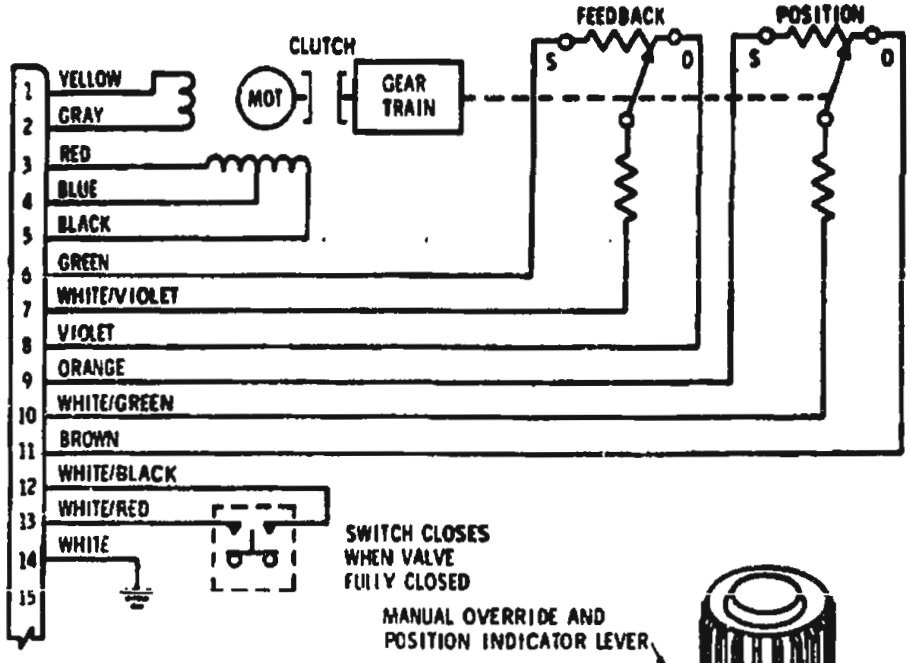
CR B. Deactivation

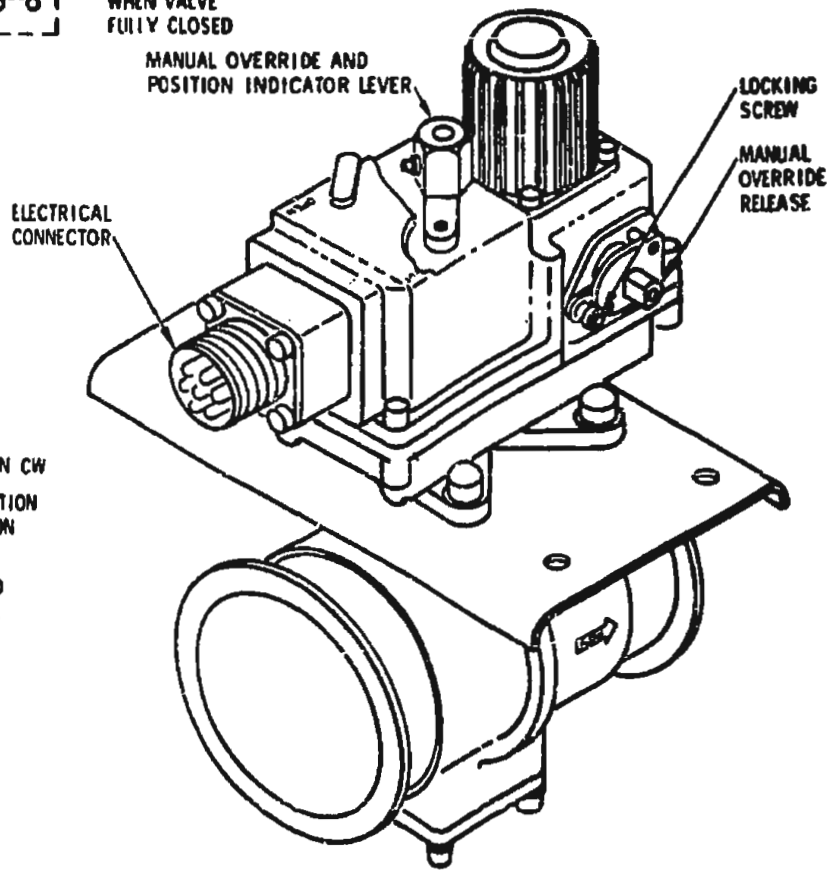
CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.





NOTE

MANUAL POSITIONING AND LOCKING INSTRUCTIONS:

1. REMOVE LOCKING SCREW
2. TURN MANUAL OVERRIDE RELEASE APPROXIMATELY ONE-QUARTER TURN CW
3. TURN MANUAL OVERRIDE AND POSITION INDICATOR LEVER TO SHUT POSITION
4. INSERT LOCKING SCREW THROUGH HOLE IN POSITION INDICATOR INTO HOUSING. TORQUE TO 20-30 LB IN. LOCKING SCREW MUST BOTTOM ON INDICATOR LEVER

M1-0103-21-011

Zone Trim Control Valve
Figure 201

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual override release, approximately one-quarter turn clockwise.

CR • Use one-half-inch wrench to position manual override and position indicator lever to the SHUT position.

CR • Insert locking screw through hole in position indication lever and screw into housing. Torque screw 20 to 30 in/lbs. Locking screw must bottom on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of actuator and turn until valve is fully closed. Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto temperature selector.

ZONE TRIM CONTROL VALVE - MAINTENANCE PRACTICES

1. General

The zone trim control valves are located in the aft right upper portion of the forward electronic service center (FESC), zone 113.

2. Referenced Procedure

21-41-17 Hot Air Manifold Isolation Valve - Maintenance Practices

21-61-27 Zone Trim Pressure Regulator Valve - Maintenance Practices

R 3. Maintenance Practices (Ref. Fig. 201)

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual override release, approximately one-quarter turn clockwise.

CR • Use one-half-inch wrench to position manual override and position indicator lever to the SHUT position.

CR • Insert locking screw through hole in position indication lever and screw into housing. Torque screw 20 to 30 in/lbs. Locking screw must bottom on indication lever.

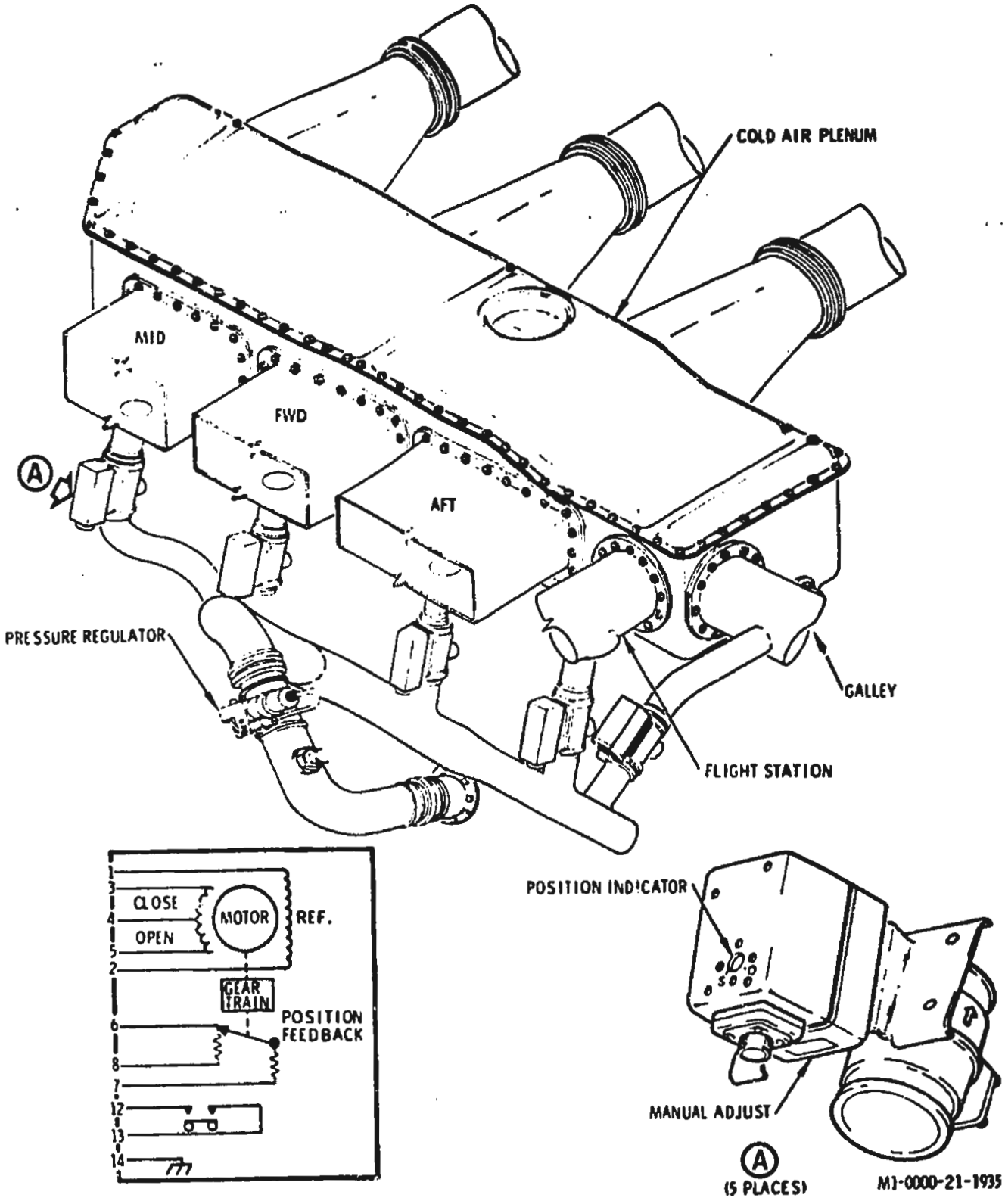
CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of actuator and turn until valve is fully closed. Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto temperature selector.



R Zone Trim Control Valve
R Figure 201

R EFFECTIVITY: 032-999

002B

ZONE TRIM CONTROL VALVE - REMOVAL AND INSTALLATION

1. General

The five zone trim control valves are in the aft right portion
R of the forward electronic service center (FESC), zone 113. The
R... valves are installed on the zone trim manifold, and each valve controls zone trim air flow from the manifold into one of the zone distribution ducts taking air from the cold air plenum (Ref. Fig. 401).

Removal and installation procedures for all valves are the same except for circuit breaker open and tag requirements.

2. Equipment and Materials

O-rings (4), MS9068-334, or equivalent

R Soft clean cloth

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

R Solvent, Methyl-ethyl-ketone (MEK), Fed Spec TT-M-261, or
R equivalent

Protective caps

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedures

20-21-01 Flexible Swaged Coupling - Removal and Inscallation

21-00-00 Air Conditioning System - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) engine
R bleed air and APU control panels and three high
R pressure ground air connections to prevent system
R operation until completion of procedure.

R (2) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag listed circuit breakers for applicable zone trim control valve:

Flight Station:

TEMP CONT - FLT STA - DC (V3),

TEMP CONT - FLT STA - AC (V4),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10).

Galley:

ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15),

ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - AC (V12).

Forward Cabin:

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - DC (V9),

ZONE CENTER TEMPERATURE CONTROL - FWD CAB - AC (V10),

TEMP CONT - FLT STA - AC (V4).

Mid Cabin:

ZONE CENTER TEMPERATURE CONTROL - MID CAB - DC (V11),

ZONE CENTER TEMPERATURE CONTROL - MID CAB - AC (V12),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14).

Aft Cabin:

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - DC (V13),

ZONE CENTER TEMPERATURE CONTROL - AFT CAB - AC (V14),

R (3) Gain access to FESC.

R WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE
R PRECAUTIONS AGAINST HIGH TEMPERATURES, USE
R PROTECTIVE GLOVES WHEN REQUIRED.

R (4) In aft right portion of FESC, locate applicable zone
R trim control valve (Ref. Fig. 401) and disconnect
R electrical cable connector from valve receptacle.

R (5) Install protective caps on connector and receptacle and
R stow cable to prevent damage.

R (6) Remove insulation blanket(s) as necessary for access to
R valve installation.

R (7) Cut lockwire and disconnect flexible swaged couplings
R (Ref. 20-21-01) at both ends of valve. Use two strap
R wrenches on coupling if necessary.

R (8) Slide coupling nuts, washers, and O-rings back onto
R body of valve (cut and discard O-rings if necessary).

R (9) Slide coupling bodies, washers, and O-rings back onto
R ducts above and below valve (cut and discard O-rings if
R necessary).

R (10) Remove retainers from over valve and duct flanges at
R both ends of valve.

R (11) Remove screws, washers, and nuts securing valve bracket
R to support bracket.

R (12) Remove valve by sliding from between ends of ducts.

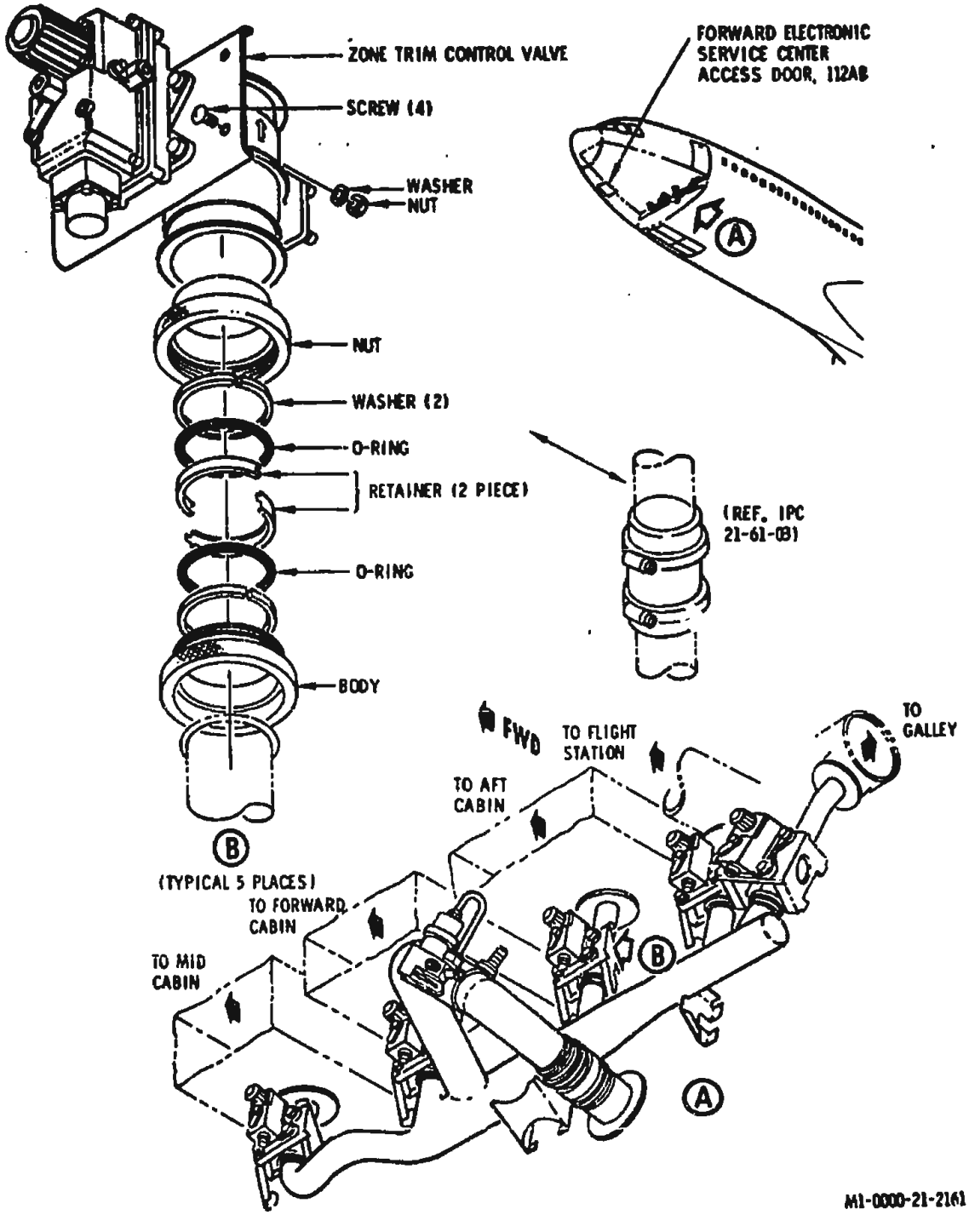
R (13) Remove flexible swaged coupling components from ducts
R and valve and discard O-rings.

R (14) Install protective caps on exposed ends of ducts and valve.

B. Installation

R (1) Verify that tags previously installed on FE/SO engine
R bleed air and APU control panels and the three
R high-pressure ground air connections are in place.

R (2) Verify circuit breakers opened in Step 4A(2) are open
R and tagged.



CR CR Zone Trim Control Valve - Removal and Installation
Figure 401

EFFECTIVITY: ALL

001B

WARNING: USE METHYL-ETHYL-KETONE (MEK) IN WELL-VENTILATED AREA. AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION.

KEEP MEK AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

CR CR NOTE: Flex duct and clamps may be substituted for Wiggins couplings. (Ref. IPC 21-61-03).

R (3) Remove protective caps and using soft clean cloth moistened with MEK solvent, clean duct and valve flanges and flexible swaged coupling components. Inspect for damage and replace any damaged component.

(4) Lubricate flexible swaged coupling components (4 O-rings, 4 washers, 2 two-piece retainers, and threads of 2 bodies and 2 nuts). Wipe all lubricant from wrenching surfaces of bodies and nuts.

(5) Install one coupling nut, one washer, and one O-ring onto each end of valve. Slide washers and O-rings into nuts.

(6) Install one coupling body, one washer, and one O-ring onto duct above valve installed position. Slide washer and O-ring into body.

(7) Install one coupling body, one washer, and one O-ring onto duct below valve installed position. Slide washer and O-ring into body.

(8) With the flow arrow on the valve body pointing upward, slide valve into position between ends of ducts.

(9) Install screws, washers, and nuts securing valve bracket to support bracket, leaving installation loose enough to permit movement of valve for coupling alignment.

(10) Install two retainer halves over valve and duct flanges at lower end of valve.

(11) Align valve and duct so retainer is fully closed and mate flexible coupling components (Ref. 20-21-01) at lower end of valve. Do not tighten coupling.

(12) Install two retainer halves over valve and duct flanges at upper end of valve.

(13) Align valve and duct so retainer is fully closed and mate flexible coupling components at upper end of valve. Do not tighten coupling.

(14) Tighten screws and nuts securing valve bracket to support bracket.

(15) Torque and lockwire flexible swaged couplings (Ref. 20-21-01) at both ends of valve.

(16) Install insulation blanket(s) removed in Step 4A(6).

(17) Remove protective caps and connect electrical cable connector to valve receptacle.

(18) Remove tags installed in Step 4A(1).

(19) Remove tags and close circuit breakers opened in Step 4A(2).

(20) Turn on air conditioning system (Ref. 21-00-00).

(21) Operate air conditioning system to use zone trim system to vary temperature of air delivered to applicable zone. Check zone trim valve installation for leaks and verify valve operation through ability to vary zone supply air temperature.

(22) Turn off air conditioning system (Ref. 21-00-00).

ZONE TRIM CONTROL VALVE - ADJUSTMENT AND TEST

1. Adjustment/Test

The zone trim control valves are not adjusted on the aircraft. The valves are tested on the aircraft with the temperature control test module (Ref. 21-60-00, Temperature Control - Adjustment and Test).

FLIGHT STATION DUCT TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

The flight station duct temperature sensors for temperature indication (Ref. 21-63-35) and for temperature control (this sensor) are mounted in adjacent bosses in the flight station supply air duct in the forward electronic service center (FESC) near the compartment ceiling. Access to the sensors is through FESC access door 112AB, with the sensor in the duct section crossing diagonally to the right of the compartment, at FS 264.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
21-63-35	Flight Station Duct Temperature Indication Sensor - Removal and Installation

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual override release, approximately one-quarter turn clockwise.

CR • Use one-half-inch wrench to position manual override and position indicator lever to the SHUT position.

CR • Insert locking screw through hole in position indication lever and screw into housing. Torque screw 20 to 30 in/lbs. Locking screw must bottom on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of actuator and turn until valve is fully closed. Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto temperature selector.

FLIGHT STATION DUCT TEMPERATURE CONTROL SENSOR REMOVAL AND INSTALLATION

1. General

The flight station duct temperature sensors for temperature indication (Ref. 21-63-35) and for temperature control (this sensor) are mounted in adjacent bosses in the flight station supply air duct in the forward electronic service center (FESC) near the compartment ceiling. Access to the sensors is through FESC access door 112AB, with the sensor in the duct section crossing diagonally to the right of the compartment, at FS 264.

2. Referenced Procedures

21-60-00 Temperature Control - Adjustment and Test

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Gasket, P/N 1519219-101, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec QQ-W-390 Cond A, or equivalent

Protective caps

Masking tape, 1-inch wide

4. Removal/installation

A. Removal

R (1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag circuit breakers:

R TEMP CONT - FLT STA - DC (V3) and AC (V4).

(2) Open FESC access door 112AB.

(3) In FESC overhead (FS 264 and RBL 35), disconnect electrical cable connector from flange mounted sensor receptacle and install protective caps on connector and receptacle.

(4) Remove screws securing sensor flange to duct boss and remove sensor.

(5) Remove and discard gasket.

(6) If new sensor is not immediately available for installation, apply strip of masking tape over sensor mounting holes.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Carefully remove masking tape from sensor mounting area and verify area is clean and smooth.

(3) Install new gasket on sensor and install sensor in duct, using screws retained from removal.

(4) Remove protective caps and connect and lock-wire electrical cable connector to sensor receptacle.

(5) Remove tags and close circuit breakers opened in Step 4A(1).

(6) Turn on electrical power (Ref. 24-00-00).

(7) Perform pertinent portion (BITE) of Temperature Control - Adjustment and Test procedure (Ref. 21-60-00) to verify sensor installation.

(8) Close FESC access door 112AB.

(9) Turn off electrical power (Ref. 24-00-00).

R DUCT TEMPERATURE CONTROL SENSORS - CLEANING AND PAINTING

1. General

Cleaning procedures for the duct temperature sensors are the same except for removal and installation procedures. The flight station duct sensor is installed in the flight station supply duct in the aft right corner of the forward electronic service center. The three cabin duct sensors are installed in the cabin overhead supply ducts above ceiling panel 233AB in the forward cabin. The galley duct sensor is installed in the galley supply duct behind sidewall panel 123FL in the left forward corner of the forward cargo compartment.

2. Equipment and Materials

Isopropyl alcohol

3. Referenced Procedures

21-61-12	Flight Station Duct Temperature Sensor - Removal and Installation
21-61-13	Cabin Duct Temperature Sensor - Removal and Installation
21-61-16	Galley Duct Temperature Sensor - Removal and Installation

4. Cleaning/Painting

(1) Remove duct temperature sensor (Ref. 21-61-12, 21-61-13, or 21-61-16 as applicable).

(2) Clean probe, mounting flange, and electrical connector using cotton swab moistened with isopropyl alcohol.

(3) Inspect sensor externally for damage. A damaged sensor must be replaced.

(4) Install duct temperature sensor (Ref. 21-61-12, 21-61-13, or 21-61-16 as applicable).

CABIN DUCT TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

There are three cabin duct temperature sensors for temperature indication (Ref. 21-63-36) and three for temperature control (these sensors). One of each type sensor is mounted, in adjacent bosses, in the duct supplying air to each cabin zone.

All cabin duct temperature sensors are mounted in the three ducts above the forward cabin ceiling, with access through ceiling panel 233AB. The forward cabin sensors are in the center duct at FS436, mid cabin sensors in the right hand duct at FS543, and aft cabin sensors in the left hand duct at FS543.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
21-63-36	Cabin Duct Temperature Indication Sensor - Removal and Installation
25-26-01	Forward, Mid, and Aft Ceiling Trim Drop Panels - Removal and Installation

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

R CABIN DUCT TEMPERATURE CONTROL SENSOR - REMOVAL AND INSTALLATION

1. General

There are three cabin duct temperature sensors for temperature indication (Ref. 21-63-36) and three for temperature control (these sensors). One of each type sensor is mounted, in adjacent bosses, in the duct supplying air to each cabin zone.

All cabin duct temperature sensors are mounted in the three ducts above the forward cabin ceiling, with access through ceiling panel 233AB. The forward cabin sensors are in the center duct at FS 436, mid cabin sensors in the right hand duct at FS 543, and aft cabin sensors in the left hand duct at FS 543.

2. Referenced Procedures

21-60-00	Temperature Control - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices
25-26-01	Forward, Mid, and Aft Ceiling Trim Drop Panels - Removal and Installation

3. Equipment and Materials

Gasket, P/N 1519219-101, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec QQ-W-390 Cond A, or equivalent

Protective caps

Masking tape, 1-inch wide

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag applicable ZONE CENTER TEMPERATURE CONTROL circuit breakers:

FWD CAB - DC (V9) and AC (V10)

MID CAB - DC (V11) and AC (V12)

R AFT CAB - DC (V13) and AC (V14)

R (2) Open ceiling panel 233AB (Ref. 25-26-01).

R (3) Locate applicable sensor:

R Forward cabin: center duct at FS 436

R Mid Cabin: right hand duct at FS 543

R Aft Cabin: left hand duct at FS 543

R (4) Disconnect electrical cable connector from flange
R mounted sensor receptacle and install protective caps
R on connector and receptacle.

R (5) Remove screws securing sensor flange to duct boss and
R remove sensor.

R (6) Remove and discard gasket.

R (7) If new sensor is not immediately available for
R installation, apply strip of masking tape over sensor
R mounting holes.

R B. Installation

R (1) Verify circuit breakers opened in Step 4A(1) are open
R and tagged.

R (2) Carefully remove masking tape from sensor mounting area
R and verify area is clean and smooth.

R (3) Install new gasket on sensor and install sensor in
R duct, using screws retained from removal.

R (4) Remove protective caps and connect and lock-wire
R electrical cable connector to sensor receptacle.

R (5) Remove tags and close circuit breakers opened in Step
R 4A(1).

R (6) Turn on electrical power (Ref. 24-00-00).

R (7) Perform pertinent portion (BITE) of Temperature Control
R - Adjustment and Test procedure (Ref. 21-60-00) to
R verify sensor installation.

R (8) Install ceiling panel 233AB (Ref. 25-26-01).

R (9) Turn off electrical power (Ref. 24-00-00).

GALLEY DUCT TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

The galley duct temperature sensors for temperature indication (Ref. 21-63-39) and for temperature control (this sensor) are mounted in adjacent bosses in the galley supply air duct in the left cheek area outboard of the forward cargo compartment. Access to the sensors is through compartment sidewall panel 123FL, with sensors at FS514.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
21-63-39	Galley Duct Temperature Indication Sensor - Removal and Installation
25-61-06	Cargo Compartment Liner Panels - Removal and Installation

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

GALLEY DUCT TEMPERATURE CONTROL SENSOR REMOVAL AND INSTALLATION

1. General

The galley duct temperature sensors for temperature indication (Ref. 21-63-39) and for temperature control (this sensor) are mounted in adjacent bosses in the galley supply air duct in the left cheek area outboard of the forward cargo compartment. Access to the sensors is through compartment sidewall panel 123FL, with the sensors at FS 514.

2. Referenced Procedures

21-60-00	Temperature Control - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices
25-51-06	Cargo Compartment Liner Panels - Removal and Installation

3. Equipment and Materials

Gasket, P/N 1519219-101, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec QQ-W-390 Cond A, or equivalent

Protective caps

Masking tape, 1-inch wide

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers (FE/SO) aft circuit
R breaker panel CB3, zone 215, open and tag circuit
R breakers:

R ZONE CENTER TEMPERATURE CONTROL

R GALLEY - DC (V15)

R GALLEY - AC (V16)

(2) Open forward cargo compartment sidewall panel 123FL (Ref. 25-51-06).

(3) Disconnect electrical cable connector from flange mounted sensor receptacle and install protective caps on connector and receptacle.

(4) Remove screws securing sensor flange to duct boss and remove sensor.

(5) Remove and discard gasket.

(6) If new sensor is not immediately available for installation, apply strip of masking tape over sensor mounting holes.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Carefully remove masking tape from sensor mounting area and verify area is clean and smooth.

(3) Install new gasket on sensor and install sensor in duct, using screws retained from removal.

(4) Remove protective caps and connect and lock-wire electrical cable connector to sensor receptacle.

(5) Remove tags and close circuit breakers opened in Step 4A(1).

(6) Turn on electrical power (Ref. 24-00-00).

(7) Perform pertinent portion (BITE) of Temperature Control - Adjustment and Test procedure (Ref. 21-60-00) to verify sensor installation.

(8) Install compartment liner panel (Ref. 25-51-06).

(9) Turn off electrical power (Ref. 24-00-00).

FLIGHT STATION ZONE TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

The flight station zone temperature sensor (control) is mounted on the forward side of the flight station/cabin bulkhead, above the right corner of the flight station entry door.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17 Hot Air Manifold Valve - Maintenance Practices

21-61-07 Zone Trim Control Valve - Maintenance Practices

21-61-27 Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

FLIGHT STATION ZONE TEMPERATURE CONTROL SENSOR MAINTENANCE PRACTICES

1. General

The flight station zone temperature sensors for temperature monitor indication (Ref. 21-63-30) and for temperature control (this sensor) are mounted together in the instrument cooling fan inlet duct under the Flight Engineer/Second Officers table.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
21-63-30	Flight Station Zone Temperature Indication Sensor - Removal and Installation

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

FLIGHT STATION ZONE TEMPERATURE CONTROL SENSOR REMOVAL AND INSTALLATION

1. General

The flight station zone temperature control sensor is mounted on the forward side of the flight station/cabin bulkhead, above the right corner of the flight station entry door.

2. Referenced Procedures

21-60-00 Temperature Control - Adjustment and Test

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers:

TEMP CONT - FLT STA - DC (V3)

TEMP CONT - FLT STA - AC (V4)

(2) In flight station, above right corner of flight station entry door, remove screws and washers securing cover over temperature sensor electrical connector and remove cover.

(3) Disconnect electrical cable connector from sensor receptacle and install protective caps on cable connector and sensor receptacle.

(4) Note position of sensor grounding wire, remove screws, washers and nuts securing sensor to mounting bracket, and remove sensor.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install sensor in bracket, using screws, washers and nuts retained from removal and installing ground wire as noted in Step 4A(4).

(3) Remove protective caps and connect electrical cable connector to sensor receptacle.

(4) Remove tags and close circuit breakers opened in Step 4A(1).

(5) Turn on electrical power (Ref. 24-00-00).

(6) Perform pertinent portion (BITE) of Temperature Control - Adjustment and Test procedure (Ref. 21-60-00) to verify sensor installation.

(7) Install cover over sensor electrical connector, using screws and washers retained from removal.

(8) Turn off electrical power (Ref. 24-00-00).

FLIGHT STATION ZONE TEMPERATURE CONTROL SENSOR REMOVAL AND INSTALLATION

1. General

Two flight station zone temperature sensors, one for temperature indication (Ref. 21-63-30) and another for temperature control (this sensor) are mounted together in the instrument cooling fan inlet duct under the Flight Engineer/Second Officers table.

2. Referenced Procedures

21-60-00	Temperature Control - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breakers:

TEMP CONT - FLT STA - DC (V3)

TEMP CONT - FLT STA - AC (V4).

On overhead circuit breaker panel CB2, zone 215, also open and tag circuit breaker INSTR - COOLING (A21).

(2) On Flight Engineer/Second Officers instrument panel install placard DO NOT OPERATE FORWARD ELECTRONICS SERVICE CENTER EQUIPMENT OR TURN ON AIRCRAFT ELECTRICAL GROUND SERVICE SYSTEM.

(3) Remove instrument cooling fan inlet cover panel (inlet grille) and screen from the Flight Engineer/Second Officers kickshield (under Flight Engineer/Second Officers work table).

(4) Disconnect electrical cable connector from sensor receptacle (forward sensor) and install protective caps on cable connector and sensor receptacle.

(5) Remove two screws, washers and nuts securing sensor in the duct and pull sensor out.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Verify placard installed in Step 4A(2) is in place.

(3) Install sensor in duct, using screws, washers and nuts retained from removal.

(4) Remove protective caps and connect electrical cable connector to sensor receptacle.

(5) Remove tags and close circuit breakers opened in Step 4A(1).

(6) Remove placard installed in Step 4A(3).

(7) Turn on electrical power (Ref. 24-00-00).

(8) Perform pertinent portion (BITE) of Temperature Control - Adjustment and Test procedure (Ref. 21-60-00) to verify sensor installation.

(9) Install instrument cooling fan inlet cover panel (inlet grille) and screen removed in Step 4A(2).

(10) Turn off electrical power (Ref. 24-00-00).

C ZONE TEMPERATURE SENSOR COLLECTOR ASSEMBLY - CLEANING/PAINTING

C 1. General

C Cleaning procedure is the same for all three (3) cabin zone
C temperature collector assemblies.

C 2. Equipment and Materials

C Low pressure air

C Isopropyl alcohol

C 3. Referenced Procedures

C 21-61-17 Zone Temperature Control Sensors Cleaning and
C Painting

C 25-22-03 Module - Passenger Service Outboard Overhead -
C Removal/Installation

C 4. Cleaning/Painting

C (1) Gain access to cabin zone temperature sensor and
C temperature bulb and remove same.

C (2) Lower passenger service module under sensor collector
C assembly.

C (3) Remove clamp and flex hose from assembly.

C (4) Blow out and clean interior of collector assembly with
C alcohol, if necessary.

C (5) Clean flex hose as necessary.

C (6) Re-install flex hose.

C (7) Close passenger service module.

CR (8) Clean temperature sensor and bulb, as required,
CR utilizing low pressure air or alcohol.

CR (9) Re-install temperature sensor and bulb.

CABIN ZONE TEMPERATURE CONTROL SENSORS MAINTENANCE PRACTICES

1. General

There are three cabin zone temperature sensors for temperature indication (Ref. 21-63-31) and three for temperature control (these sensors). One of each type sensor is mounted in a mounting assembly in each cabin zone. The mounting assemblies are installed in the lower inboard edge of the right hand outboard overhead stowage modules.

Sensor mounting assemblies are located as follows:

Forward cabin: FS 565, above the ninth window aft of the right front passenger (R1) door.

Mid cabin: FS 1020, above the fifth window aft of the right mid passenger (R2) door.

Aft cabin: FS 1580, above the second window aft of the right aft passenger (R3) door.

R Jet pump assemblies, using air from the individual air outlet system in each cabin zone, provide cabin exhaust air flow across the sensors in each assembly.

Maintenance practices are the same for all three sensors, except for sensor location and circuit breaker references.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-41-17	Hot Air Manifold Valve - Maintenance Practices
21-61-07	Zone Trim Control Valve - Maintenance Practices
21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
21-63-31	Cabin Zone Temperature Indication Sensor - Removal and Installation

4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual override release, approximately one-quarter turn clockwise.

CR • Use one-half-inch wrench to position manual override and position indicator lever to the SHUT position.

CR • Insert locking screw through hole in position indication lever and screw into housing. Torque screw 20 to 30 in/lbs. Locking screw must bottom on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

CABIN ZONE TEMPERATURE CONTROL SENSORS - REMOVAL AND INSTALLATION

1. General

There are three cabin zone temperature sensors for temperature indication (Ref. 21-63-31) and three for temperature control (these sensors). One of each type sensor is mounted in a mounting assembly in each cabin zone. The mounting assemblies are installed in the lower inboard edge of the right hand outboard overhead stowage modules.

Sensor mounting assemblies are located as follows:

Forward cabin: FS 565, above the ninth window aft of the right front passenger (R1) door.

Mid Cabin: FS 1020, above the fifth window aft of the right mid passenger (R2) door.

Aft Cabin: FS 1580, above the second window aft of the right aft passenger (R3) door.

Jet pump assemblies, using air from the individual air outlet system in each cabin zone, provide cabin exhaust air flow across the sensors in each assembly.

Removal and installation procedures are the same for all three sensors, except for sensor location and circuit breaker references.

2. Referenced Procedures

21-60-00	Temperature Control - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel, CB3, zone 215, open and tag applicable ZONE CENTER TEMPERATURE CONTROL circuit breakers:

R FWD CAB - DC (V9)

R FWD CAB - AC (V10)

R MID CAB - DC (V11)

R MID CAB - AC (V12)

R AFT CAB - DC (V13)

R AFT CAB - AC (V14)

(2) Open overhead stowage compartment door above sensor mounting assembly:

Forward cabin: above ninth window aft of right front passenger (R2) door.

Mid cabin: above fifth window aft of right mid passenger (R2) door.

Aft cabin: above second window aft of right aft passenger (R3) door.

(3) Remove screws and washers securing perforated pan in mounting assembly.

(4) Gently lower perforated pan, containing sensors, just enough for access to sensor.

(5) Disconnect electrical cable connector from larger of two sensors in perforated pan and install protective caps on cable connector and sensor receptacle.

(6) Remove screws securing sensor flange to mounting bracket and remove sensor.

(7) If new sensor is not immediately available for installation, secure perforated pan and sensor assembly to prevent weight of assembly from hanging on electrical wiring.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install sensor in bracket, using screws and washers retained from removal.

(3) Remove protective caps and connect electrical cable connector to sensor receptacle.

(4) Remove tags and close circuit breakers opened in Step 4A(1).

(5) Turn on electrical power (Ref. 24-00-00).

(6) Perform pertinent portion (BITE) of Temperature Control - Adjustment and Test procedure (Ref. 21-60-00) to verify sensor installation.

(7) Install perforated pan in mounting assembly, using screws and washers retained from removal.

(8) Close stowage compartment door above mounting assembly.

(9) Turn off electrical power (Ref. 24-00-00).

C C GALLEY ZONE TEMPERATURE CONTROL SENSOR
C MAINTENANCE PRACTICES

C 1. General

C The galley zone temperature sensors for temperature monitor
C indication (Ref. 21-63-34) and for temperature control (this
C sensor) are mounted together in a mounting assembly between the
C left and right galley lifts, behind a screened opening below the
C galley intercommunication panel. A jet pump unit is used to
C provide air flow across the sensors.

C 2. Equipment and Materials

C Protective Caps

C 3. Referenced Procedures

C	21-41-17	Hot Air Manifold Valve - Maintenance Practices
C	21-61-07	Zone Trim Control Valve - Maintenance Practices
C C	21-61-27	Zone Trim Pressure Regulator and Shutoff Valve - Maintenance Practices
C C	21-63-34	Galley Zone Temperature Indication Sensor - Removal and Installation
C	24-00-00	Electrical Power - Maintenance Practices
C	25-32-00	Galley Lift System - Adjustment and Test

C 4. Maintenance Practices

CR A. General

CR (1) This deactivation procedure should be used for closing
CR a trim valve when any of the following is inoperative:

CR (a) Zone Auto Temperature Selector

CR (b) Zone Auto Temperature Controller

CR (c) Zone Trim Valve

CR (d) Zone Duct Temperature Sensor

CR (e) Zone Temperature Sensor

CR (2) If associated trim valve cannot be closed, deactivate
CR trim air PRSOV (21-61-27) closed.

CR B. Deactivation

CR (1) Depress (out) associated zone trim control switch on
CR FE/SO cabin temp control panel, Zone 215.

CR (2) "Close" legend should illuminate.

CR (3) Visually check that associated trim valve has closed
CR (FESC, Zone 113).

CR (4) If "close" legend does not illuminate or trim valve is
CR not closed, manually lock trim valve closed.

CR (a) Trim valve with external clutch as follows:

CR • Remove locking screw from manual override
CR release on side of actuator housing.

CR • Use one-half-inch wrench to rotate manual
CR override release, approximately one-quarter turn
CR clockwise.

CR • Use one-half-inch wrench to position manual
CR override and position indicator lever to the SHUT
CR position.

CR • Insert locking screw through hole in position
CR indication lever and screw into housing. Torque
CR screw 20 to 30 in/lbs. Locking screw must bottom
CR on indication lever.

CR (b) Trim valve without external clutch as follows:

CR • Insert 3/16-inch allen wrench into base of
CR actuator and turn until valve is fully closed.
CR Check position indicator on top of actuator.

CR (5) Remove associated zone temperature control relay (Flt
CR Sta 21-61-K3; Fwd Cab 21-62-K6/Mid Cab 21-63-K9/Aft Cab
CR 21-64-K12/Galley 21-65-K15).

CR (6) Stow relay for reinstallation.

CR (7) Install "inop" placard under associated zone auto
CR temperature selector.

GALLEY ZONE TEMPERATURE CONTROL SENSOR - REMOVAL AND INSTALLATION

R 1. Referenced Procedures

21-60-00 Temperature Control - Adjustment and Test

R 2. Equipment and Materials

R Protective cap (electrical connector)

R 3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breakers:

R ZONE CENTER TEMPERATURE CONTROL - GALLEY - DC (V15)

R ZONE CENTER TEMPERATURE CONTROL - GALLEY - AC (V16)

R (2) Remove cover from side of mounting assembly and
R disconnect electrical cable connector from galley zone
R temperature control sensor (Ref. Fig. 401).

R (3) Install protective cap on electrical cable connector and stow cable to prevent damage.

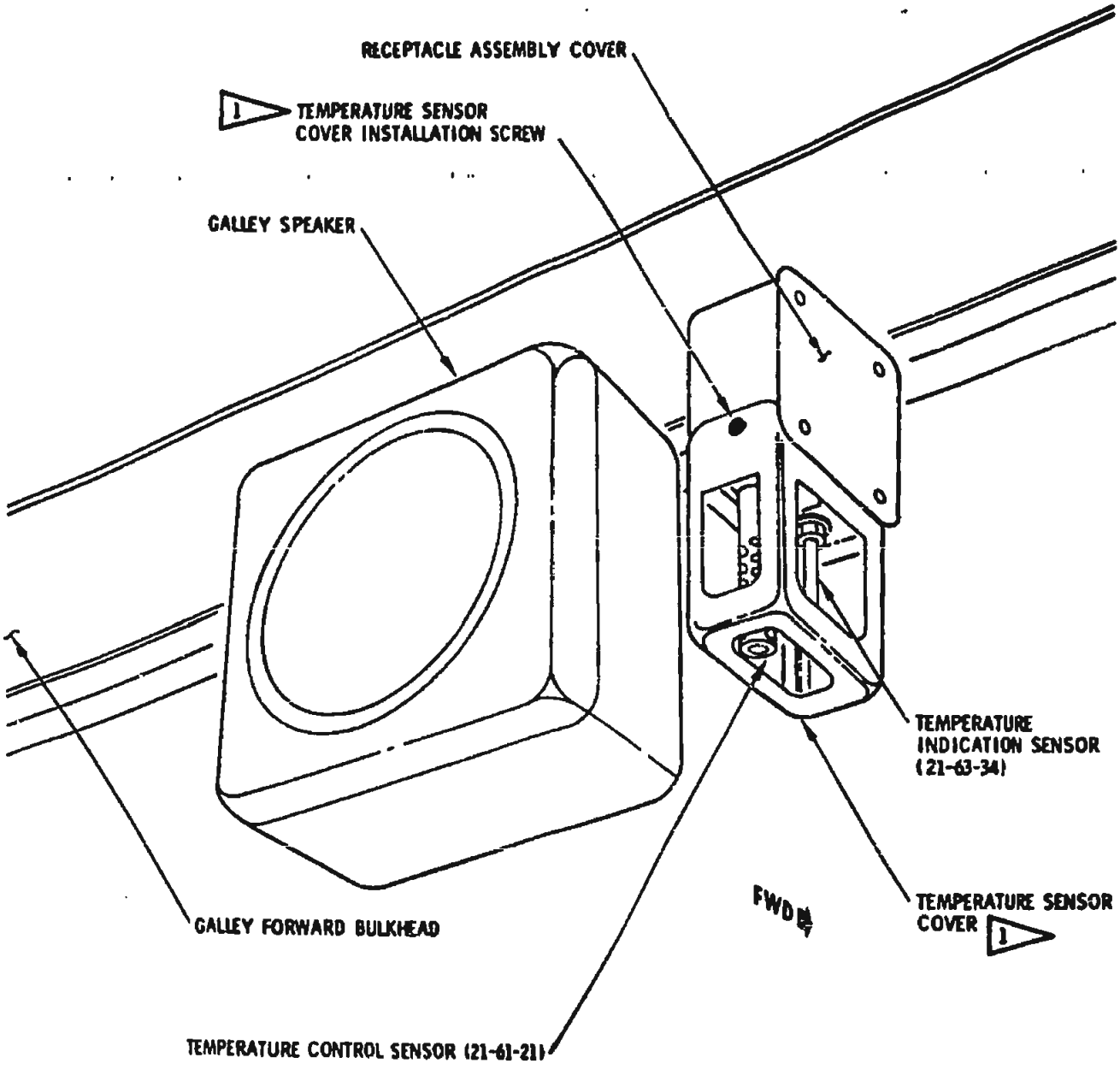
(4) On aircraft 001-031 without SB21-114, remove two screws securing sensor in mounting assembly and pull sensor straight out of assembly.

(4) On aircraft 001-031 with SB21-114,
R remove temperature control sensor cover (Ref. Fig. 401)
R and remove two screws securing sensor in mounting assembly and pull sensor straight out of assembly.

B. Installation

R (1) Verify circuit breakers opened in Steps 3A(1) are open and tagged.

(2) Install galley zone temperature control sensor in mounting assembly, using two screws retained from removal.



NOTE:

1 ON AIRCRAFT WITH SB21-114

M1-0001-21-244

R Galley Temperature Control Sensor
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

(3) Remove protective cap and connect electrical cable connector to sensor receptacle.

(4) On aircraft 001-031 without SB21-114, install mounting assembly cover.

(4) On aircraft 001-031 with SB21-114, install mounting assembly cover and temperature control sensor cover.

R (5) Remove tags and close circuit breakers opened in Step
R 3A(1).

R (6) Verify proper sensor installation and operation by
R performing Galley BITE Test (Ref. 21-60-00).

ZONE TRIM PRESSURE REGULATOR VALVE - MAINTENANCE PRACTICES

1. General

In the event the zone trim pressure regulator valve should malfunction in the closed position, the following procedure may be followed which will allow the valve to go full open and stay there.

On valves without Hamilton Standard SB21-1100, the zone trim pressure regulator is a fail-closed type valve.

On valves with Hamilton Standard SB21-1100, the zone trim pressure regulator is a fail-open type valve.

The zone trim pressure regulator valve is in the aft right portion of the forward electronic service center (FESC). It is installed in the trim system supply air duct that runs diagonally upward and outboard from the compartment aft bulkhead to the duct supplying the zone trim control valves.

2. Equipment and Materials

R Protective caps.

R 1/2 inch hex wrench.

3. Maintenance Practices

A. Deactivation

(1) Open FESC access door 112AB.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

R (2) On Aircraft without Hamilton Standard SB 21-1052, remove the metal tube, P/N 740218 that connects the valve regulator and valve actuator (Ref. Fig. 201). Attach tube to valve with tape.

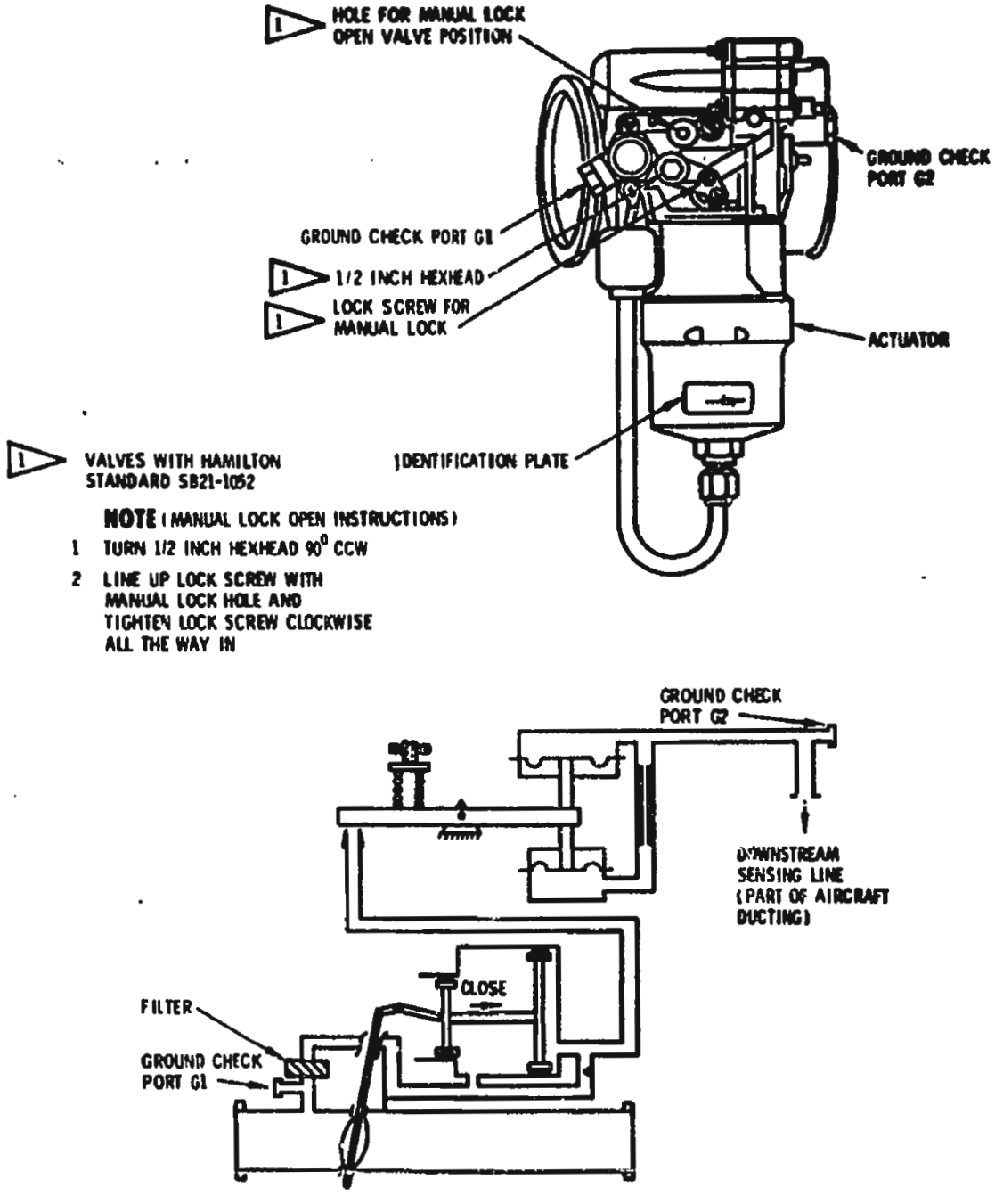
R (2) On Aircraft with Hamilton Standard SB 21-1052, turn hex nut actuator arm (Ref. Fig. 201) 90 degrees counterclockwise.

R (3) On Aircraft without Hamilton Standard SB 21-1052, cap off the fittings on the open ends of the regulator and actuator sections.

R (3) On Aircraft with Hamilton Standard SB 21-1052, line up lock screw with manual lock hole (Ref. Fig. 201) and tighten lock screw clockwise all the way in.

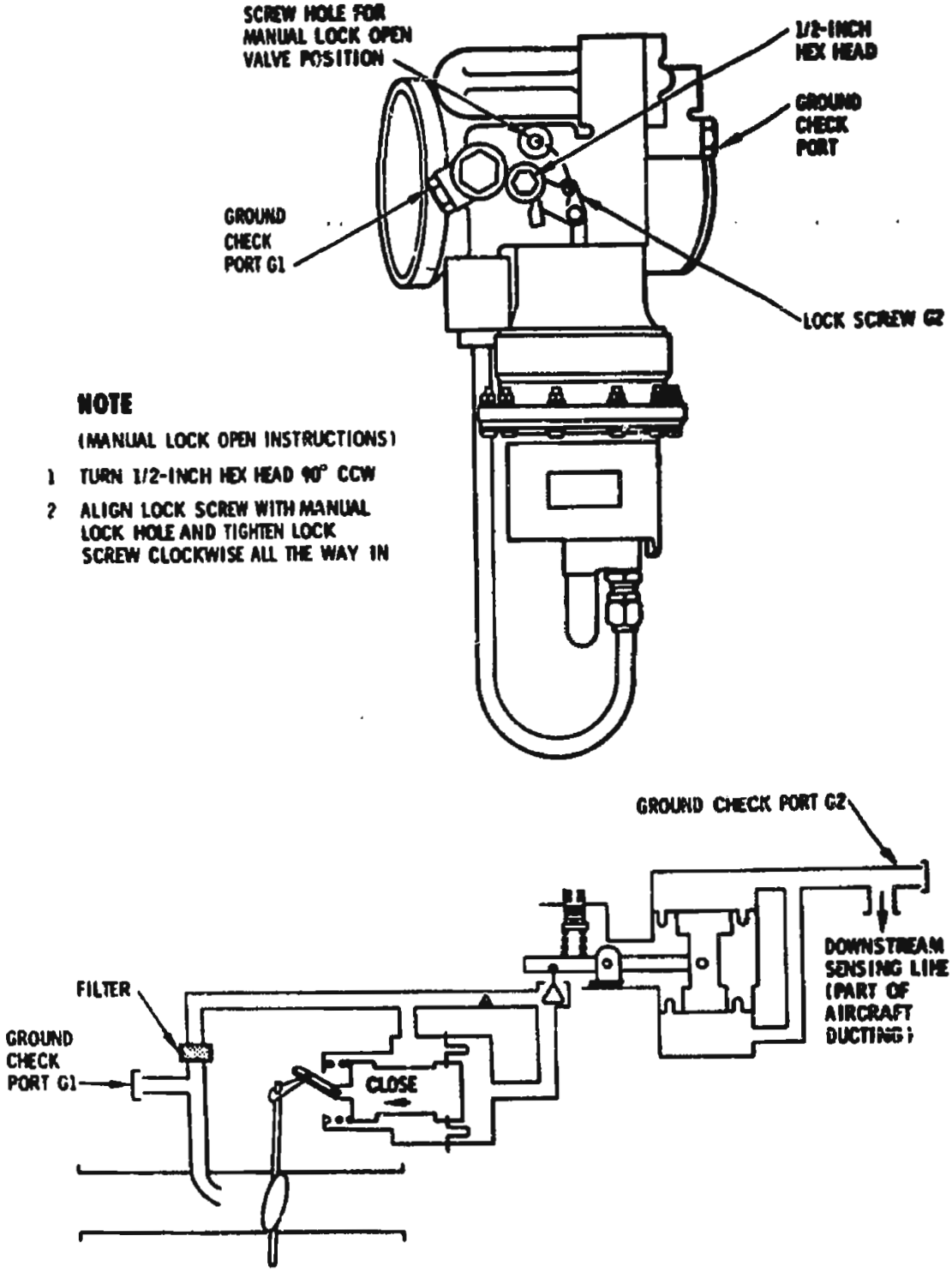
(4) Close FESC access door 112AB.

(5) Make appropriate entry in aircraft log book to replace zone trim pressure regulator valve.


1 HOLE FOR MANUAL LOCK OPEN VALVE POSITION
GROUND CHECK PORT G2
GROUND CHECK PORT G1
1 1/2 INCH HEXHEAD
1 LOCK SCREW FOR MANUAL LOCK
ACTUATOR
IDENTIFICATION PLATE
1 VALVES WITH HAMILTON STANDARD SB21-1052
NOTE (MANUAL LOCK OPEN INSTRUCTIONS)
1 TURN 1/2 INCH HEXHEAD 90° CCW
2 LINE UP LOCK SCREW WITH MANUAL LOCK HOLE AND TIGHTEN LOCK SCREW CLOCKWISE ALL THE WAY IN
GROUND CHECK PORT G2
DOWNSTREAM SENSING LINE (PART OF AIRCRAFT DUCTING)
CLOSE
FILTER
GROUND CHECK PORT G1
A1-0101-21-263

Zone Trim Pressure Regulator Valve - Deactivation
Figure 201

R EFFECTIVITY: VALVES WITHOUT HAMILTON STANDARD
R SB21-1100
831B


SCREW HOLE FOR MANUAL LOCK OPEN VALVE POSITION
1/2-INCH HEX HEAD
GROUND CHECK PORT
GROUND CHECK PORT G1
LOCK SCREW G2
NOTE
(MANUAL LOCK OPEN INSTRUCTIONS)
1 TURN 1/2-INCH HEX HEAD 90° CCW
2 ALIGN LOCK SCREW WITH MANUAL LOCK HOLE AND TIGHTEN LOCK SCREW CLOCKWISE ALL THE WAY IN
GROUND CHECK PORT G2
DOWNSTREAM SENSING LINE (PART OF AIRCRAFT DUCTING)
FILTER
GROUND CHECK PORT G1
CLOSE

Zone Trim Pressure Regulator Valve - Deactivation
Figure 201

ZONE TRIM PRESSURE REGULATOR VALVE - REMOVAL AND INSTALLATION

1. General

The zone trim pressure regulator valve is in the aft right portion of the forward electronic service center (FESC). It is installed in the trim system supply air duct that runs diagonally upward and outboard from the compartment aft bulkhead to the duct supplying the zone trim valves.

2. Equipment and Materials

Zone Trim Pressure Regulator Valve

O-rings (2), MS9068-346, or equivalent

O-ring, MS9385-06, or equivalent

Lubricant, Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

Solvent, Methyl-ethyl-ketone (MEK), or equivalent

Protective caps and plugs

Lockwire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

Valve Air Filter

Filter (Hamilton Standard PN 727604-4)

Preformed Packing (Hamilton Standard PN 69494J910)

Lockwire MS20995C20, 0.020-inch diameter corrosion resistant steel, or equivalent per Fed Spec AS567

R Lubricant Dow Corning 44 or equivalent

3. Referenced Procedures

20-21-01	Flexible Swaged Coupling - Removal and Installation
20-36-01	Single T-bolt V-band Coupling - Removal and Installation
21-00-00	Air Conditioning System - Maintenance Practices

4. Removal/Installation - Zone Trim Pressure Regulator Valve

A. Removal

R **WARNING:** TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(1) Open FESC access door 112AB.

(2) In aft right portion of FESC, disconnect downstream pressure sensing tube from L-fitting at bottom of pressure regulator valve.

(3) Remove L-fitting from bottom of valve, remove and discard O-ring.

(4) Install protective plugs in valve port and tube fitting.

(5) Remove insulation blanket(s) as necessary for access to valve installation.

(6) Cut lockwire and disconnect flexible swaged coupling (Ref. 20-21-01) at upper (outboard) end of valve. Use two strap wrenches if necessary.

(7) Slide coupling nut, washer, and O-ring back onto body of valve (cut and discard O-ring if necessary).

(8) Slide coupling body, washer, and O-ring back onto duct (cut and discard O-ring if necessary).

(9) Remove retainer from over valve and duct flanges.

(10) Remove single T-bolt V-band coupling from lower (inboard) end of valve (Ref. 20-36-01). Slide coupling onto duct below valve.

(11) Aft of valve, remove screw, washer, and nut attaching valve anti-rotation bracket to support bracket.

(12) Support valve and remove band-clamp attaching valve to support bracket.

(13) Remove valve by sliding from between ends of duct.

(14) Remove flexible swaged coupling components from duct and valve and discard O-rings.

(15) Install protective caps on exposed ends of ducts and valve.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

R USE SOLVENT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN
R AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG,
R SKIN OR EYE IRRITATION.

(1) Remove protective caps and clean duct and valve flanges and flexible swaged coupling components with solvent. Inspect for damage and replace any damaged component.

(2) Lubricate flexible swaged coupling components (2 O-rings, 2 washers, 1 two-piece retainer, and coupling body and nut threads). Wipe all lubricant from wrenching surfaces of body and nut.

(3) Install coupling body, one washer, and one O-ring on duct above valve position (outboard). Slide washer and O-ring into coupling body.

(4) Install coupling nut, one washer, and one O-ring on discharge end of valve (as shown by flow arrow on valve body). Slide washer and O-ring into coupling nut.

(5) Verify single T-bolt V-band coupling is on duct below valve position (inboard).

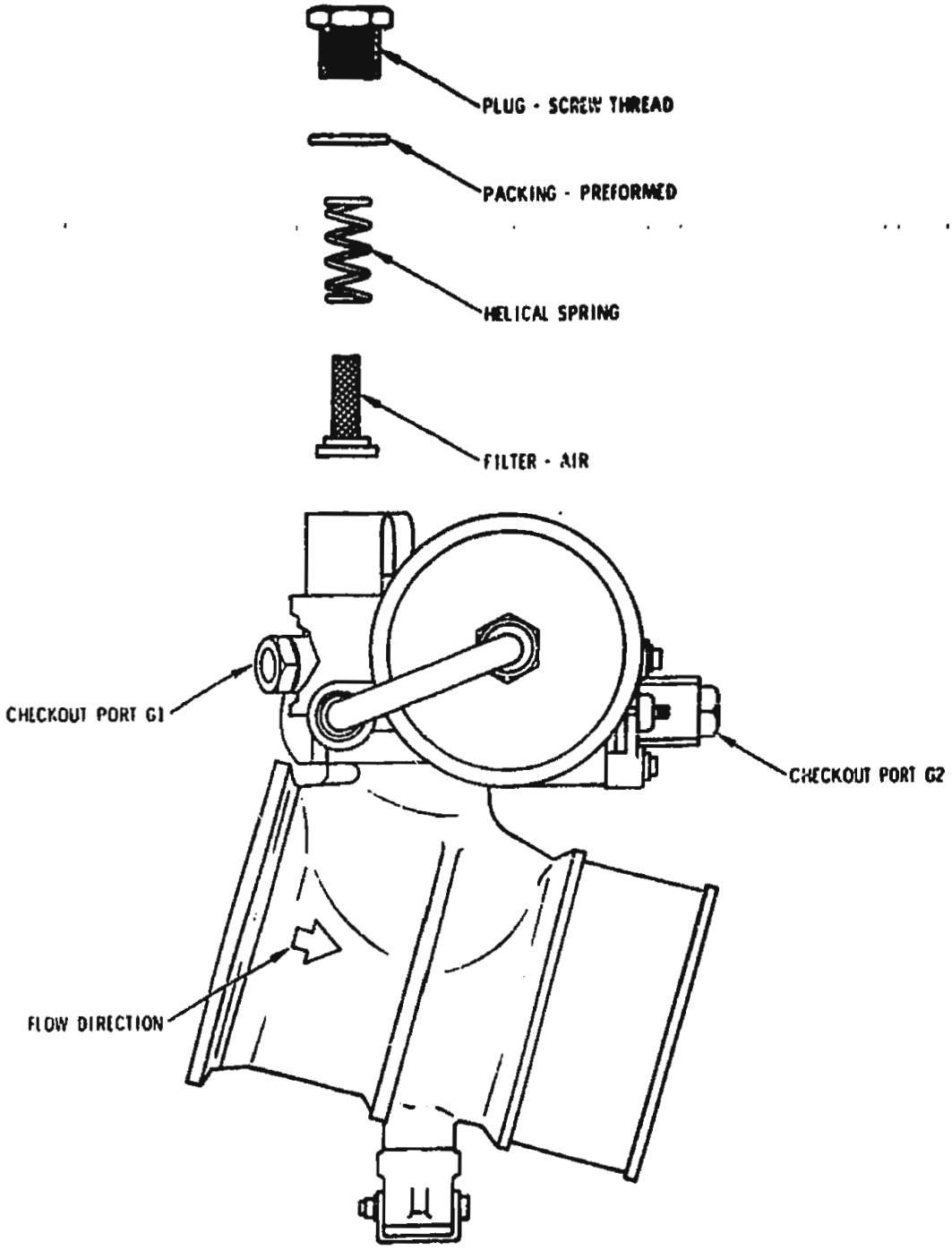
(6) Slide valve into position between duct ends, with flow arrow point upward (outboard).

(7) Install single T-bolt V-band coupling (Ref. 20-36-01). Do not tighten coupling.

(8) Install two retainer halves over valve and duct flanges at upper end of valve.

(9) Align valve and duct so retainer is fully closed and mate flexible swaged coupling components (Ref. 20-21-01). Do not tighten coupling.

(10) Install band-clamp attaching valve to support bracket. Do not tighten clamp.



M1-0101-21-264

R Zone Trim Pressure Regulator - Removal Installation
R Figure 401

(11) Rotate valve as necessary and install screw, washer, and nut attaching valve anti-rotation bracket to support bracket.

(12) Torque and lockwire flexible swaged coupling (Ref. 20-21-01).

(13) Torque single T-bolt V-band coupling (Ref. 20-36-01).

(14) Torque band-clamp attaching valve to support bracket.

(15) Install new O-ring on L-fitting, remove protective plug from downstream sensing port of valve, and install L-fitting.

(16) Remove protective plug from downstream pressure sensing tube and connect tube to L-fitting.

(17) Remove WARNING tags installed in Step 4.

(18) Turn on air conditioning system (Ref. 21-00-00).

(19) Operate air conditioning system to vary usage of trim air from minimum to maximum. Check pressure regulator valve installation for leaks and verify that valve position modulates, with amount of opening proportional to trim air usage.

(20) Turn off air conditioning system (Ref. 21-00-00).

(21) Install insulation blanket(s) removed in Step 4A(5).

(22) Close FESC access door 112AB.

5. Removal/Installation - Valve Air Filter

A. Removal

R CAUTION: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

(1) Open FESC access door 112AB.

(2) Remove insulation blanket as necessary for access to valve installation.

(3) Remove lockwire from filter plug.

(4) Remove plug, preformed packing, helical compression spring and filter (Ref. Fig. 401).

(5) Inspect spring. If damaged replace spring Hamilton Standard P/N 727591-4 (spring load is 18 to 22 lbs at 1.42 inch).

B. Installation

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO
R BLEED AIR AND APU CONTROL PANELS AND THE THREE
R HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

CAUTION: FILTER MUST BE INSTALLED WITH FLANGED END FIRST (REF. FIG. 401).

(1) Install new preformed packing (Hamilton Standard P/N 69494J910). Lubricate preformed packing with Dow Corning 44A or equivalent.

(2) Install filter (flanged end first) in filter cavity, followed by plug with preformed packing (Ref. Fig. 401).

(3) Tighten and lockwire plug.

(4) Remove WARNING tags installed in Step 5.

AIR CYCLE PACK CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

The air cycle pack control system supplies temperature-controlled air through the cold air plenum to the zone trim system (Ref. 21-61-00).

R Each of the five zone temperature controllers sends its zone
R temperature requirements to the pack controllers. Flight
R station and galley zone temperature controllers send signals the
R No. 1 pack and the three cabin zones send signals to all three
R packs. Each pack controller selects the minimum temperature requested, and the No. 1 pack air temperature will usually be the coldest needed for the flight station or galley and the No. 2 and No. 3 packs the coldest required by any cabin zone. When No. 1 pack is not in use, flight station and galley temperature requirements are transferred to No. 2 pack and plenum baffling maintains satisfactory air distribution to all five zones.

Each of the three independent air cycle pack control systems (Ref. Fig. 1) consists of a pack temperature controller, a ram air exhaust control (actuator, linkage, and exhaust valve), a turbine bypass valve, a pack discharge temperature sensor, and two valve position indicators.

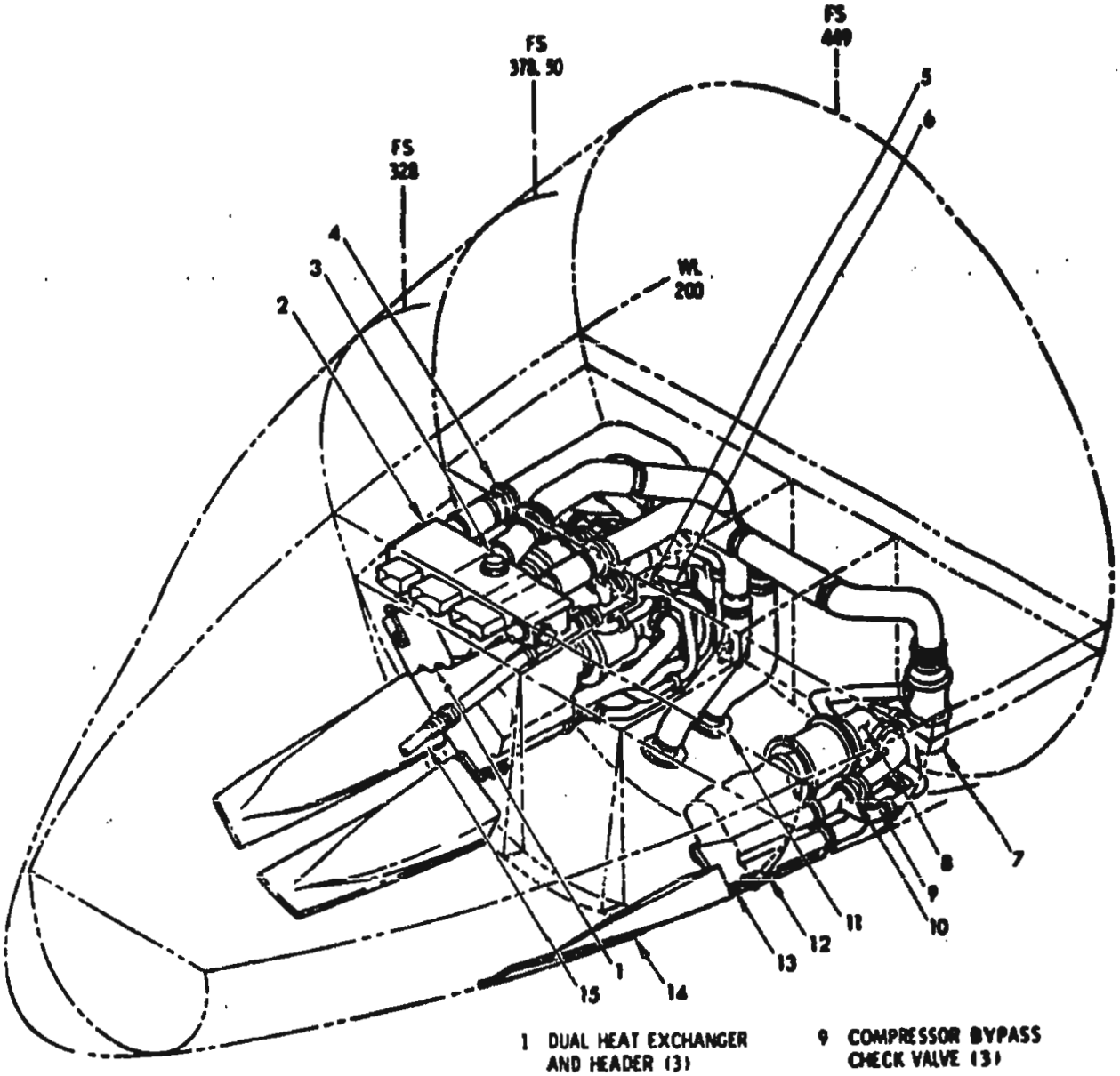
On aircraft 001-031 without SB21-115, a pack ice sensor is also part of each pack control system.

2. Operation

The temperature of the air leaving each pack to enter the cold air plenum is sensed by the pack discharge temperature sensors (Ref. Fig. 2). The temperature at each of the three sensors is compared with the coldest temperature required by the zone trim temperature controllers. The difference between the two input signals is amplified and applied to a most-open selector.

On aircraft 001-031 without SB21-115, the difference signal is compared with the pack ice sensor signal before being applied to the turbine bypass valve servo amplifier. The temperature error is applied to a servoamplifier that positions the turbine bypass valve. The valve controls the flow of relatively warm heat exchanger discharge air into the pack discharge duct to produce the desired air temperature.

When the turbine bypass valve reaches the full-open position and more heat is required, the servo amplifier for the ram air actuator is enabled. The actuator then positions the ram air



1 DUAL HEAT EXCHANGER AND HEADER (3)
2 COLD AIR PLENUM
3 COLD AIR PLENUM RELIEF VALVE
4 PACK DISCHARGE CHECK VALVES (3)
5 HOT AIR MANIFOLD
6 HOT AIR MANIFOLD ISOLATION VALVE (2)
7 WATER SEPARATOR (3)
8 AIR CYCLE MACHINE (3)
9 COMPRESSOR BYPASS CHECK VALVE (3)
10 TURBINE BYPASS CHECK VALVE (3)
11 PRECONDITIONED GROUND AIR CONNECTION (2)
12 RAM AIR EXHAUST VALVE (3)
13 RAM AIR EXHAUST VALVE ACTUATOR (3)
14 RAM AIR INLET (3)
15 TO ZONE TRIM SYSTEM

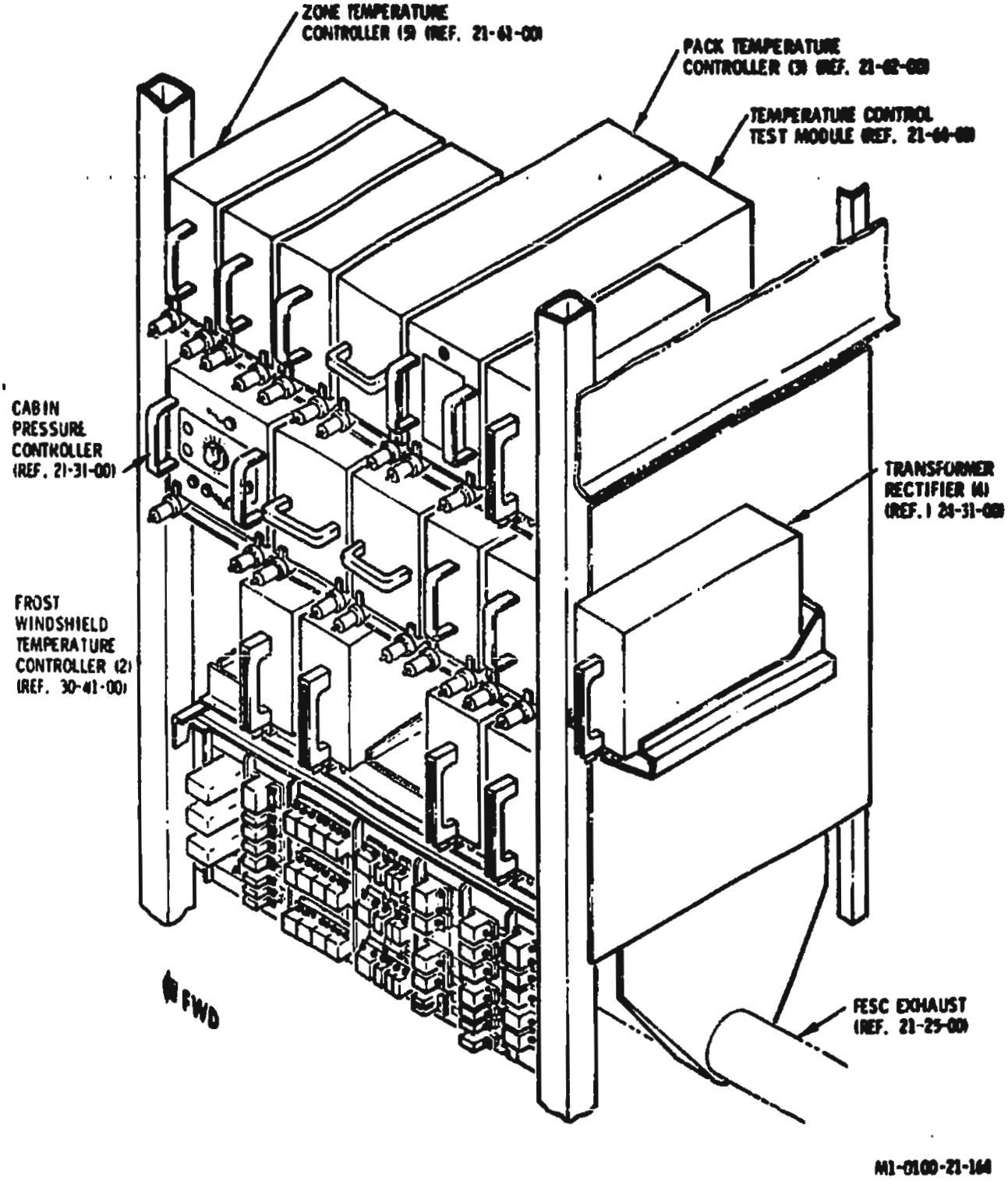
M1-0106-21-068

R
R

Air Cycle System
Figure 1 (Sheet 1)

EFFECTIVITY: ALL

001B


ZONE TEMPERATURE CONTROLLER (5) (REF. 21-61-00)
PACK TEMPERATURE CONTROLLER (3) (REF. 21-62-00)
TEMPERATURE CONTROL TEST MODULE (REF. 21-64-00)
CABIN PRESSURE CONTROLLER (REF. 21-31-00)
TRANSFORMER RECTIFIER (4) (REF. 24-31-00)
FROST WINDSHIELD TEMPERATURE CONTROLLER (2) (REF. 30-41-00)
FWD
FESC EXHAUST (REF. 21-25-00)
M1-0100-21-164

Air Cycle System
Figure 1 (Sheet 2)

exhaust valve toward closed. When they are closed, maximum heat is being supplied.

On aircraft 001-031 without SB21-115, when ice begins to form in the water separator, the differential pressure across the water separator increases. When the system is operating in the automatic mode, the pack ice sensor signals this pressure increase as an increase in voltage to the pack controller. The signal is amplified by the pack controller and applied through the most-open detector to the turbine bypass valve servoamplifier. Thus, the turbine bypass valve opens, allows more hot air to pass, and reduces the amount of ice. The ice sensor is limited to air temperatures below 40 degrees F.

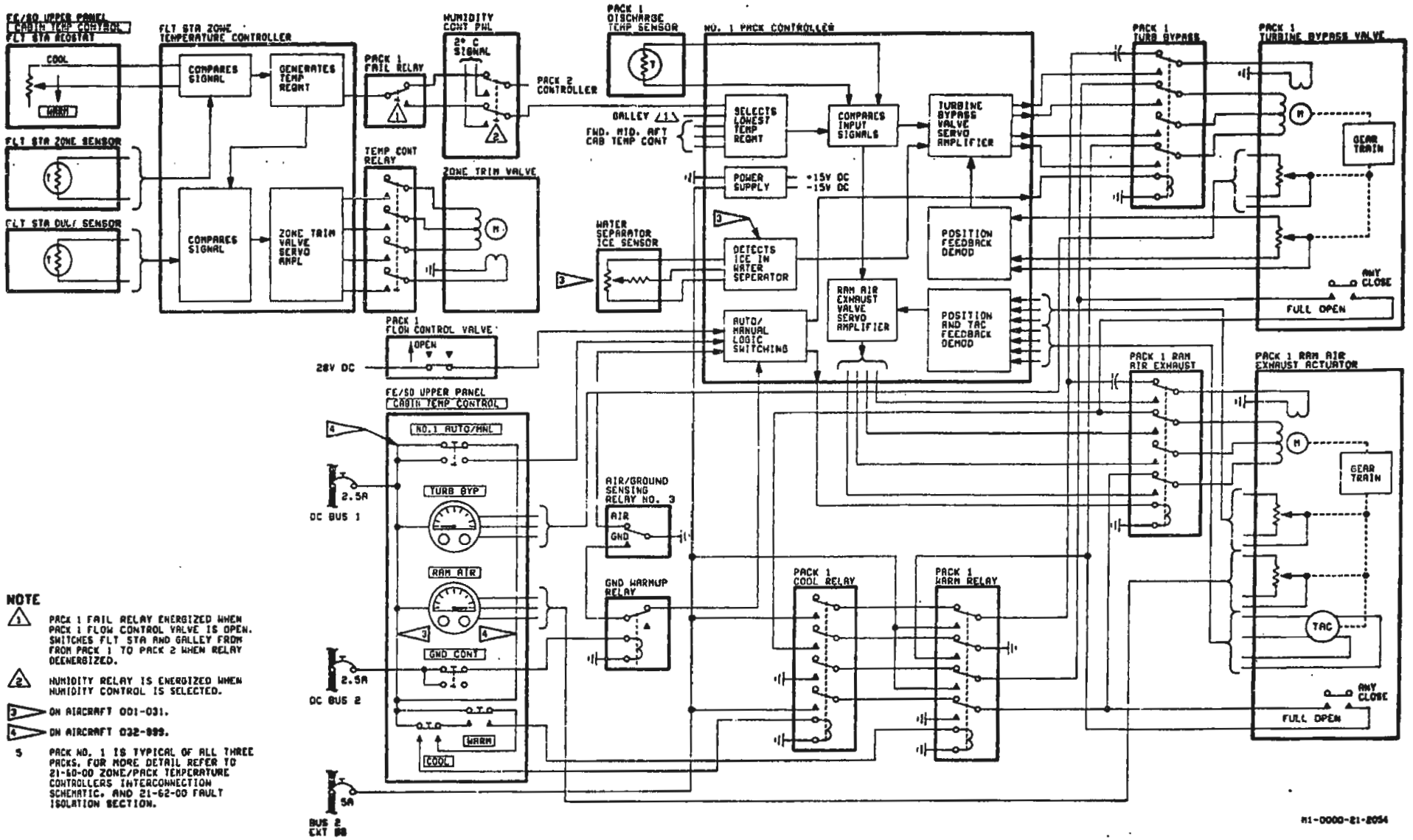
When a pack system is operated in the manual mode the pack ice sensor is inoperative, and cannot prevent ice formation in the water separator. Pack discharge temperature must be monitored and manually maintained above freezing to prevent water separator blockage.

During ground operation (Ref. Fig. 3), the ground-air safety relay supplies a ground to the pack controller, which causes the ram air control actuator to open the exhaust valve. When the GND CONT RAM AUTO switchlight on the ENGINE BLEED CONTROL panel is released (out), the ram air control returns to automatic control.

When the pack flow control valve (Ref. 21-21-00) closes, 28V dc is removed from the pack temperature controller, which prepositions the turbine bypass valve to 37 degrees open (11 o'clock position) and the ram air exhaust valve to the full-open position, (28 percent in flight, 100 percent on ground). When the pack flow control valve opens, 28V dc is applied to the power interrupt circuit to remove the prepositioning signals. When PACK AUTO/MNL switchlight is depressed, AUTO is illuminated. Ram air doors and turbine bypass valves modulate automatically, to provide temperature control. Setting of zone temperature selectors control packs and zone trim valves to regulate the zone temperatures. Release of AUTO/MNL switchlight arms COOL and WARM switches for manual control of ram air exhaust valve and turbine bypass valve.

R 3. Dehumidification System

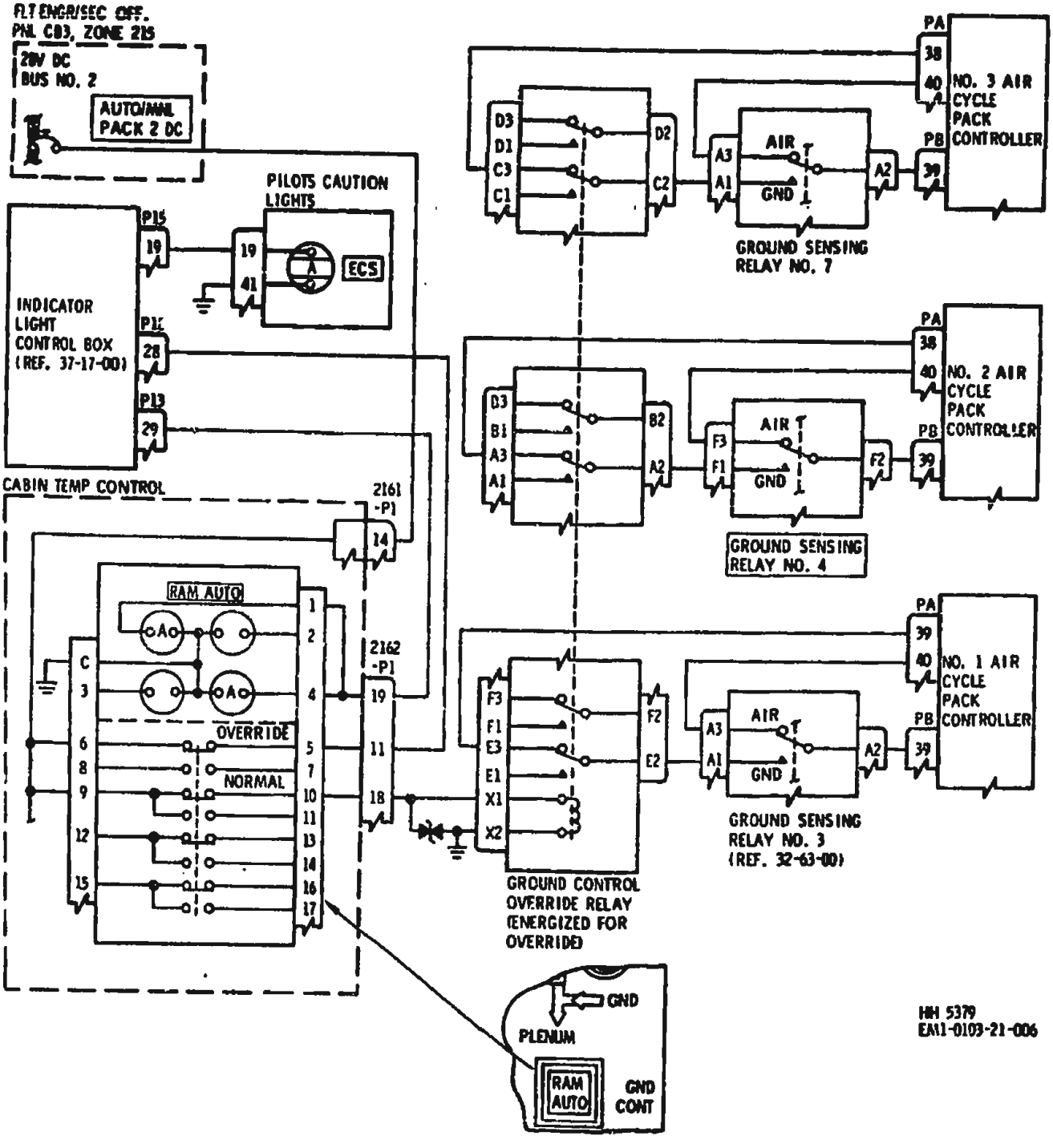
R For system operation under high humidity conditions, the
R dehumidification system provides removal of the maximum amount of moisture from pack discharge air. When the humidity control system is selected for use (Ref. Fig. 4) the zone controllers are disconnected from the pack controllers and a simulated demand for 38 degrees F (2 degrees C) pack discharge temperature is supplied to all three pack controllers. The zone trim system



R No. 1 Pack Auto/Manual Control Simplified Schematic
R Figure 2

EFFECTIVITY: ALL

001B



Air Cycle Pack Ground Warmup Override Schematic
Figure 3

(Ref. 21-61-00) then adds hot air from the hot air manifold to achieve required zone temperatures in all five zones.

4. Pack Temperature Controller

A. Description

The pack temperature controller (three per aircraft) is used to control the pack discharge temperature. The controller supplies position signals to the turbine bypass valve and the ram air exhaust control actuator in response to the zone temperature controller, and the pack discharge temperature signals.

On aircraft 001-031 WITHOUT SB21-115
the pack temperature controller also responds to signals

B. Operation

(1) Automatic Mode

The pack temperature controller selects the lowest of the five zone duct temperatures and compares it with the pack discharge temperature. The difference between the two signals and zero (error signal) is amplified and applied to position the turbine bypass valve and the ram air exhaust control actuator. In going from full-cold to full-hot, internal function generators open the turbine bypass valve and then close the ram air exhaust valve to protect the pack air cycle machine from overtemperatures.

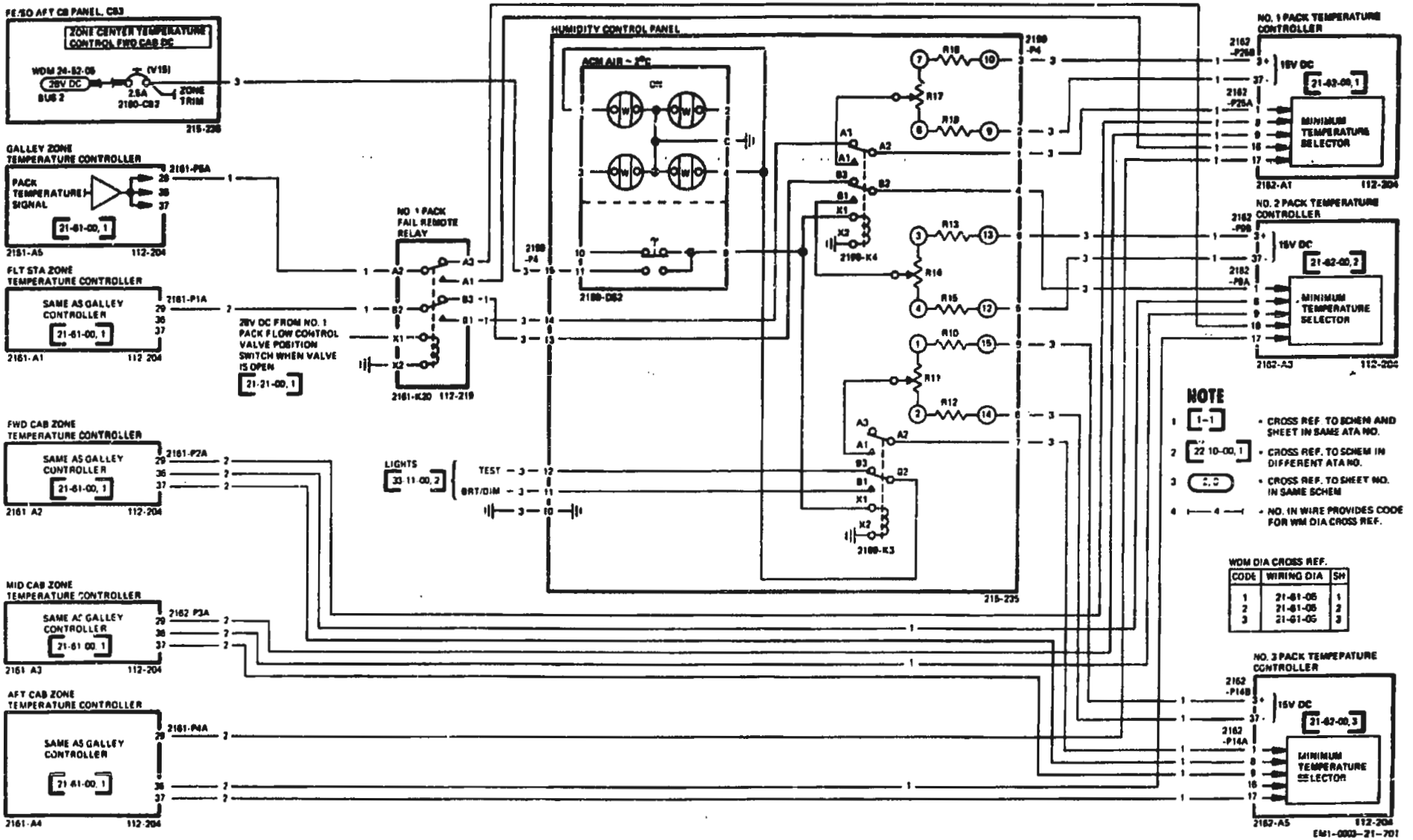
(2) Manual Mode

The turbine bypass valve and the ram air exhaust valve may also be positioned manually. In the manual mode, the valve sequencing is accomplished through the valve actuator limit switches.

(3) Ground Mode

During ground operation the pack controller keeps the ram air exhaust valve in the full-open position for maximum cooling airflow. Automatic operation of the controller may be selected if the outside air temperature is too low, by use of the GND CONT RAM AUTO switchlight (to reduce cooling airflow).

(4) Startup Mode


ZONE CENTER TEMPERATURE CONTROL FWD CAB PC
GALLEY ZONE TEMPERATURE CONTROLLER
PACK TEMPERATURE SIGNAL
FLT STA ZONE TEMPERATURE CONTROLLER
SAME AS GALLEY CONTROLLER
NO 1 PACK FAIL REMOTE RELAY
28V DC FROM NO. 1 PACK FLOW CONTROL VALVE POSITION SWITCH WHEN VALVE IS OPEN
HUMIDITY CONTROL PANEL
FWD CAB ZONE TEMPERATURE CONTROLLER
LIGHTS
TEST
BRT/DIM
MID CAB ZONE TEMPERATURE CONTROLLER
AFT CAB ZONE TEMPERATURE CONTROLLER
NO. 1 PACK TEMPERATURE CONTROLLER
NO. 2 PACK TEMPERATURE CONTROLLER
NO. 3 PACK TEMPEPATURE CONTROLLER
MINIMUM TEMPERATURE SELECTOR
15V DC
NOTE
CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
CROSS REF. TO SHEET NO. IN SAME SCHEM
NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
WDM DIA CROSS REF.
CODE
WIRING DIA
SH
21-61-05
EM1-0003-21-701

R Zone/Pack Temperature Controllers Interconnection Schematic
R Figure 4

EFFECTIVITY: ALL

001B

When the pack flow control valve is closed, the controller prepositions the turbine bypass valve to 37 degrees open (11 o'clock position) and the ram air exhaust valve to the full-open position (28 percent in flight, 100 percent on ground). When the pack flow control valve is opened, the valves return to normal control.

(5) Anti-Ice Control (On aircraft 001-031 without SB21-115)

When the pack water separator begins to ice, the increase in differential pressure across the water separator is detected by a potentiometer in the ice sensor. The turbine bypass valve opens in proportion to the rate at which ice forms. The valve responds to either the zone controller and pack duct temperature signal, or to the ice sensor signal, whichever requires the greater open-valve position. This condition continues until the ice condition returns to an acceptable rate.

The anti-ice circuit action is limited to temperatures below 40 degrees F to prevent an increase in pack discharge temperature due to the water separator being blocked by something other than ice.

5. Ram Air Exhaust Actuator

A. Description

The ram air exhaust actuator is an electric motor-driven linear actuator, consisting of a servoamplifier-controlled 115V ac electric motor, a reduction gear train, a jack screw, a tachometer, a brake, an extended position limit switch, and two actuator position feedback potentiometers. One potentiometer is used by the pack temperature controller to control actuator position. The second potentiometer is used to show ram air exhaust actuator position on the Flight Engineer/Second Officers CABIN TEMP CONTROL panel. The tachometer is used by the controller to control actuator speed proportional to the amount of actuator movement required. The brake holds the actuator in position when the motor excitation field is not energized. The extended position limit switch is used to sequence operation of this actuator and the turbine bypass valve during manual control of system operation.

On the ground, manual positioning of the actuator is accomplished by a multi-turn recessed head screw (Allen type) connected to the actuator gear train. When a button on the actuator case is depressed to release the actuator

brake, the recessed head screw can be rotated to extend or retract the actuator. When the button is released, the brake is again engaged and the actuator is locked in position by disabling the electrical circuit (Ref. Fig. 5).

A ram air exhaust actuator is used in each of the three air cycle packs. The actuators are installed on the sides of the respective exhaust valve frames and are connected to the valve louvers by a linkage system.

Each of the three actuators is part of one of the three independent air cycle pack temperature control systems that comprise the air cycle pack control system. Each ram air exhaust actuator controls cooling airflow through the dual heat exchanger in that system.

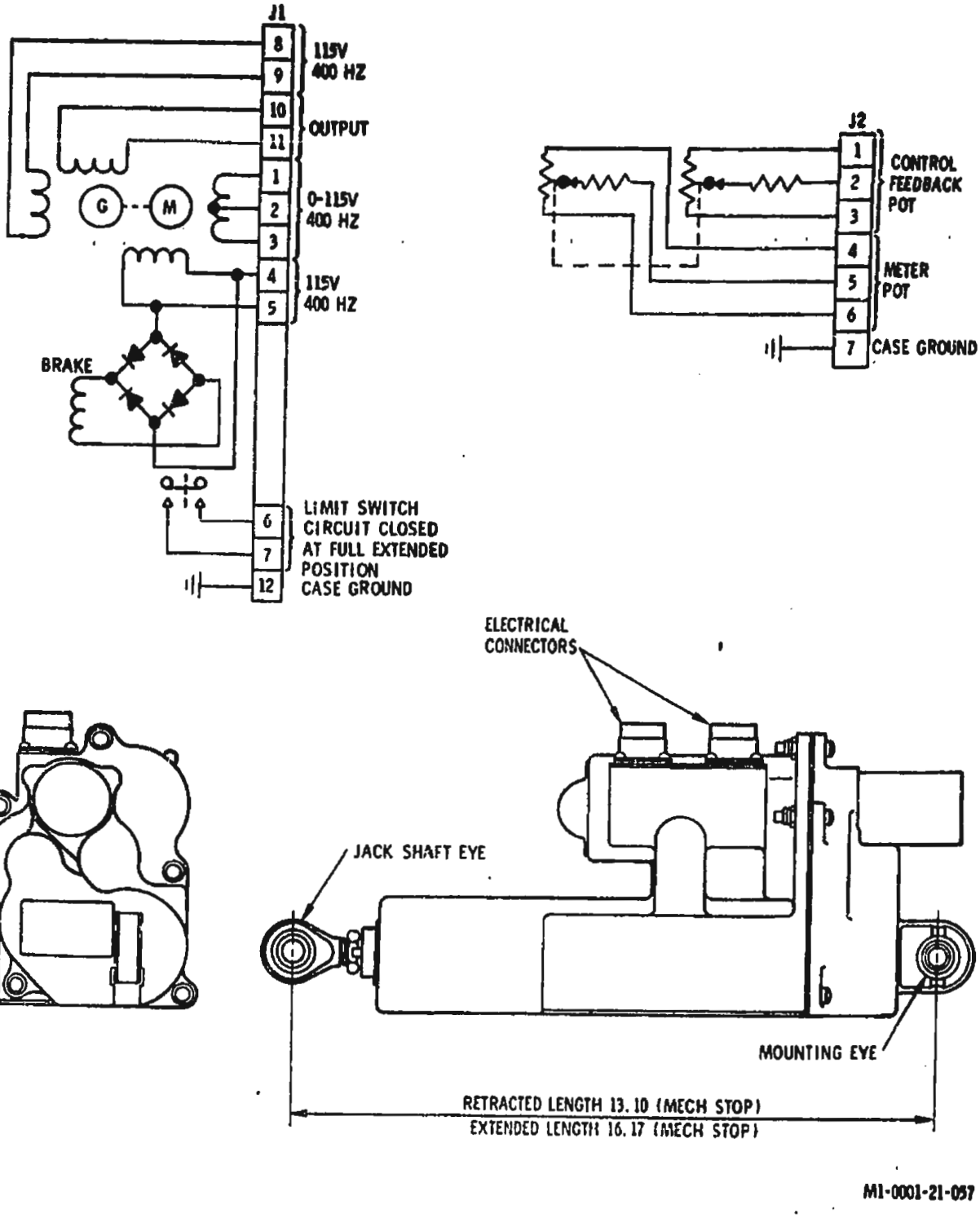
B. Operation

In flight, when ram air is available, actuator position is normally controlled by the pack temperature in each system. The controller positions the actuator and the turbine bypass valve in each system, as necessary, to obtain the pack discharge temperature needed.

To obtain minimum cooling from the dual heat exchanger, the pack temperature controller can position the actuator at the fully retracted position to close the ram air exhaust valve. This condition would be reached only under extremely cold conditions, when supply air temperature must be much warmer than normal.

Under normal conditions, the controller modulates actuator position to control ram airflow to provide the amount of heat exchanger cooling needed. As cooling requirements increase, the exhaust valve reaches the full-open position for maximum cooling airflow. If a malfunction occurs in either the zone or pack temperature control systems that results in improper automatic control of actuator position, ram air exhaust actuator and turbine bypass valve position can be manually controlled. When the manual control circuits are in use, operation of the ram air exhaust actuator and the turbine bypass valve are still sequenced. Limit switches assure that the turbine bypass valve cannot start to close until the exhaust valve is fully open.

On the ground, when ram air is not available, the normal and manual ram air exhaust actuator control circuits are overridden by the ground-air safety circuit. This override circuit, which is common to all three air cycle packs, fully opens all three exhaust valves to provide minimum restriction on dual heat exchanger cooling airflow to and



MI-0001-21-057

R Ram Air Exhaust Actuator
R Figure 5

from the air cycle machine cooling fan when the systems are in use on the ground.

During very cold weather, when full-opening of the exhaust valves is not needed, the on-ground override circuit can be disabled to allow automatic or manual modulation of the ram air exhaust actuator position to limit dual heat exchanger cooling airflow as needed.

6. Ram Air Exhaust Linkage

A. Description

The ram air exhaust linkage consists of a bellcrank, a link assembly, an idler assembly, and a bar assembly.

The bellcrank is pivoted on supports at the forward end of the exhaust valve frame (Ref. Fig. 6) and transfers the actuator motion from the side of the frame to the center line. The link assembly connects the output end of the bellcrank to the idler arm inside the valve frame. The idler arm serves to align the actuation thrust with the louver control arms and prevents straining the louvers. The bar assembly connects the louver arms to each other and to the idler assembly.

B. Operation

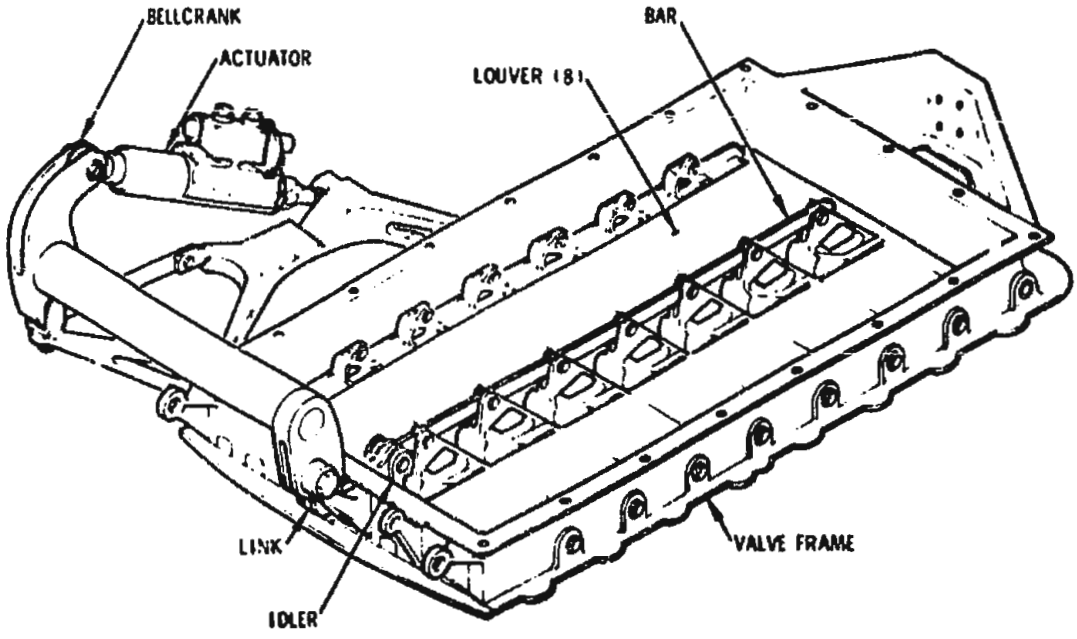
When the ram air exhaust actuator is retracted, the exhaust valve is closed. As the actuator extends, the bellcrank rotates to move the link, idler, and bar assemblies aft to open the valve louvers.

7. Ram Air Inlet Door

A. Description and Operation

The ram air inlet door is a rectangular panel with an airfoil-shaped leading edge and a continuous piano-type hinge at the aft edge. The door is of aluminum honeycomb core construction with a solid leading edge.

The hinge at the aft edge of each door is attached to the aft edge of the ram air inlet scoop forward of each heat exchanger and below the forward electronic service center, zone 113. The ram air inlet door for air cycle pack No. 1 is on the left side forward of the nose wheel well, and the ram air inlet doors for packs No. 2 and No. 3 are on the right side (Ref. Fig. 1). The ram air inlet doors are held



NOTE
CONFIGURATION FOR PACKS NO. 1 AND 3 SHOWN - PACK NO. 2 OPPOSITE.

M1-0101-21-121

Ram Air Exhaust Linkage
Figure 6

R
R
001B

EFFECTIVITY: ALL.

in fixed positions by side support plates between the door and structure.

8. Ram Air Exhaust Valve

A. Description and Operation

The ram air exhaust valve consists of a rectangular frame carrying seven end-pivoted louvers that are linked to move together. The louvers are controlled by an actuator and linkage mounted on the frame. When the valve is open, cooling airflow from the dual heat exchanger is exhausted aft and downward to provide a thrust recovery approximately equivalent to the drag produced by the ram air inlet door.

The ram air exhaust valve is flush-mounted in openings in the lower forward fuselage on each side of the nosewheel well. The valve frames, which attach to structure at the forward and aft ends of the openings, provide installation support for the dual heat exchangers (Ref. 21-51-00) in each pack. The assembly for pack No. 1 is in the left heat exchanger compartment, zone 115, and the assemblies for packs No. 2 and No. 3 are in the right heat exchanger compartment, zone 116.

The seven airfoil-shaped louvers in the valve are pivoted at both ends. An arm at the center of each louver near the leading edge projects upward and connects to the linkage between the seven louvers. An idler at the forward end of the frame connects the interlouver linkage to the linkage from the ram air exhaust actuator.

When the exhaust valve is closed, the trailing edge of each louver overlaps (below) the leading edge of the louver behind it. As the valve is opened, the trailing edges move downward. The airfoil shape of the louvers directs exhaust air aft and downward for thrust recovery. The louvers project into the slipstream beyond the forward fuselage contour to provide a positive load on the linkage system.

The valve actuators are mounted on supports permanently attached to the side of the valve frame near the forward end. For packs No. 1 and 3, the actuator is mounted on the right side of the frame. The pack No. 2 actuator is on the left side.

9. Turbine Bypass Valve

A. Description

The turbine bypass valve is a flange- and bracket-mounted, 5.5-inch-diameter, electrically actuated, butterfly-type modulating and shutoff valve. The valve actuator consists of a servoamplifier-controlled 115V ac electric motor, a reduction gear train, an open-position limit switch, and two valve position feedback potentiometers. One potentiometer is used by the pack temperature controller to control valve position. The second potentiometer is used to show turbine bypass valve position on the Flight Engineer/Second Officers CABIN TEMP CONTROL panel. The valve-open position limit switch is used to sequence operation of this valve and the ram air exhaust actuator during manual control of system operation. A manual override wrench hex and position indicator is provided on the actuator end of the butterfly shaft. A manual override release lever to disconnect the reduction gear train is mounted on the side of the actuator. If circuit or actuator malfunctions, the valve butterfly can be manually opened (Ref. Fig. 7).

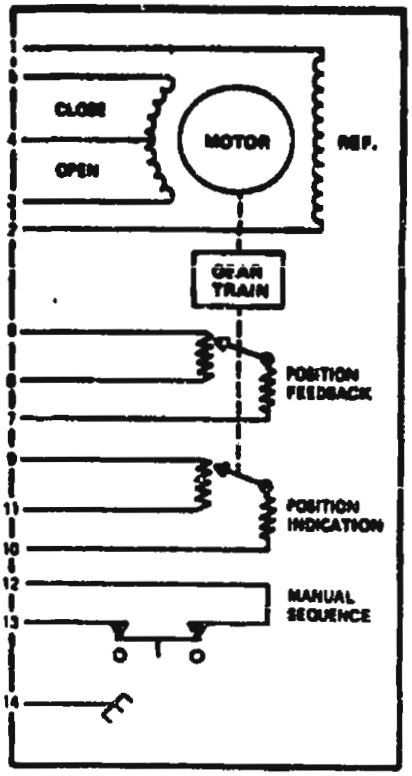
A turbine bypass valve is used in each of the three air cycle packs. The valves are mounted on the air cycle machines (Ref. 21-51-00) in the left and right environmental control system (ECS) compartments. The valve for the No. 1 air cycle pack is in the left compartment, zone 117, and the valves for the No. 2 and 3 packs are in the right compartment, zone 118.

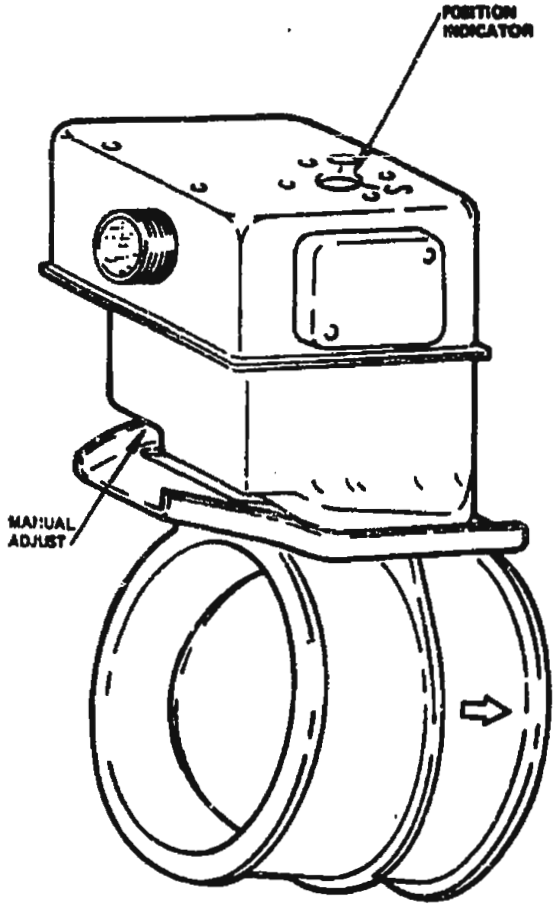
Each of the three turbine bypass valves is part of one of the three independent air cycle pack temperature control systems that comprise the air cycle pack control system. Each turbine bypass valve controls routing of secondary heat exchanger discharge air either around or through the air cycle machine turbine.

B. Operation

The turbine bypass valve position is normally controlled by the pack temperature controller in each of the three systems. The pack temperature controller positions the valve and the ram air exhaust actuator in each system, as necessary, to obtain the pack discharge temperature needed.

When the pack temperature controller has positioned the turbine bypass valve at the full-open position, all secondary heat exchanger discharge air bypasses the turbine, and the air cycle machine is not in use. At maximum cooling demand, the controller closes the bypass valve, and all secondary heat exchanger discharge air must go through the turbine for maximum air cycle machine use. Full modulation of valve position between the full-open and full-closed positions provides any amount necessary of air cycle machine use.





Mil-0000-21-1998

Turbine Bypass Valve - Removal and Installation
Figure 7

If a malfunction occurs in either the zone or pack temperature control systems that results in improper automatic valve position control, the turbine bypass valve and ram air exhaust actuator positions can be manually controlled. When the manual control circuits are in use, operation of the turbine bypass valve and the ram air exhaust actuator are still sequenced. Limit switches in each unit assure that the bypass valve cannot start to close until the ram air exhaust valve is fully open, and, conversely, the ram air exhaust actuator cannot start to close the exhaust valve until the turbine bypass valve is fully open.

10. Ice Sensor (On aircraft 001-031 without SB21-115)

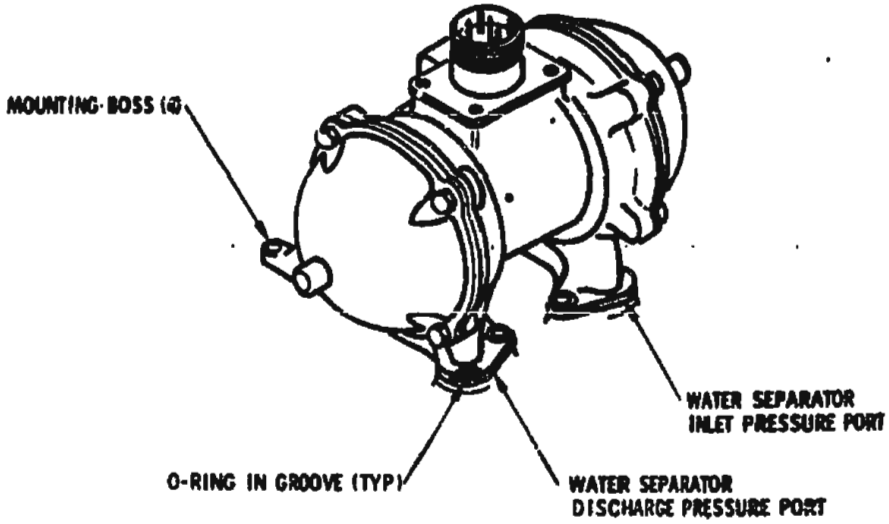
A. Description and Operation

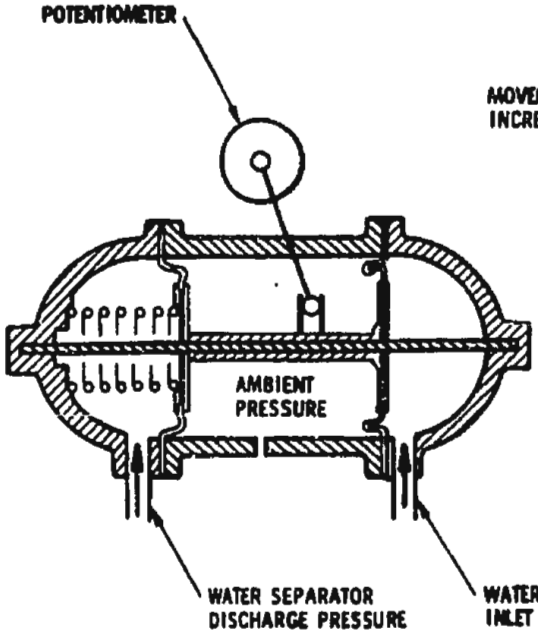
The pack ice sensor is a pressure differential sensing device composed of two pressure sensing diaphragms in tandem on a common axial shaft that is bias spring-loaded in one direction, with linear shaft movement being used to position a conductive film potentiometer. The components are enclosed in a three-piece housing, with the diaphragms at the two parting surfaces between the end bells and the central housing holding the potentiometer (Ref. Fig. 8).

A pack ice sensor is used in each of the three air cycle pack systems comprising the air cycle pack control system. Each ice sensor is mounted on the housing of one of the water separators (Ref. 21-51-00) located in the environmental control system compartments on each side of the nose wheel well. The ice sensor/water separator for pack No. 1 is in the left compartment, zone 115, and the ice sensor/water separators for packs No. 2 and No. 3 are in the right compartment, zone 116.

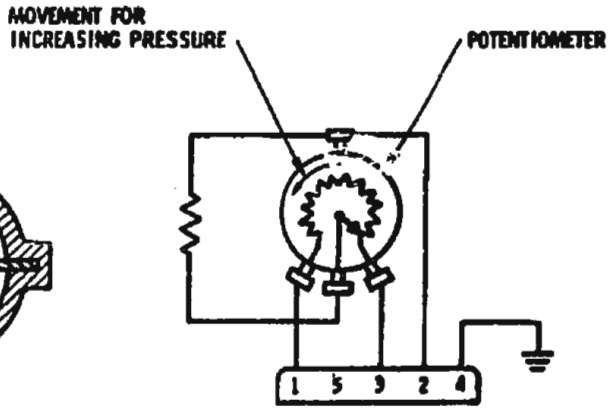
The ice sensor is attached to the water separator by four mounting bosses. Two of the bosses include drilled ports with O-ring seals that connect water separator inlet and discharge pressure pickups to the outboard side of each of the two diaphragms. The inboard sides of each diaphragm are exposed to ambient pressure. The axial shaft and two diaphragm assemblies are bias spring-loaded to oppose water separator inlet pressure.

The pack ice sensor, in conjunction with the pack temperature controller in each air cycle pack system, limits the formation of ice in the water separator by keeping pack discharge air temperature higher than the temperature where ice will form. When ice begins to form, water separator inlet pressure increases relative to discharge pressure, and





PNEUMATIC SCHEMATIC



ELECTRICAL SCHEMATIC

MM 4047
M1-A00-21-000

Ice Sensor
Figure 8

the ice sensor transmits a corresponding electrical signal to the temperature controller to limit its demand for cooling.

When air is flowing normally through the water separator, the inlet-to-discharge pressure drop is less than 1.5 pounds per square inch differential (psid). With this condition, the bias spring in the ice sensor positions the diaphragm, shaft assembly, and the potentiometer at the end of travel, and thus has no effect upon pack temperature control.

When ice begins to form on the water separator coalescer, flow restriction is increased. As inlet/discharge pressure differential increases, the potentiometer is gradually repositioned to provide a nearly linear electrical signal proportional to pressure differential from 1.5 to 3.0 psid. The pack temperature controller increases pack discharge temperature (warmer) proportionately until the ice is melted, and then maintains a discharge temperature that prevents further ice formation. When a pack system is operated in the manual mode with pack discharge temperature below freezing, ice forms on the water separator coalescer and the differential pressure (inlet versus discharge) increases. When the differential pressure in the switch reaches 3.1 to 3.5 psid, the switch closes and remains closed until the differential pressure decreases 0.5 psid.

When the differential pressure switch closes, the pack warm relay (Ref. Fig. 2, Sheet 2) for that pack is actuated, overriding manual mode control, to operate the pack system to increase pack discharge temperature. Pack discharge temperature will continue to increase until the ice melts enough to decrease water separator differential pressure enough to open the differential pressure switch, deactuating the pack warm relay.

R
R

AIR CYCLE PACK CONTROL SYSTEM FAULT ISOLATION

1. General

Reference data and fault isolation procedures for troubleshooting the Air Cycle Pack Control system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with FRM fault code number. This number and the flight log book write-up can be found in the Chapter 21 Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the entry point containing the fault isolation procedure. When no block number is specified, the entry point is block 1.

PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnect wiring.

SCHEM 4, sheet 1, shows the interconnection between the three pack temperature controllers and the Temperature Control Test Module (TCTM).

Table 1, on SCHEM 4, sheet 2, is extracted from TCTM flip charts and contains each element of 18 test performed for TCTM self-test and the 17 tests for each of the three pack temperature controllers.

SCHEM 4, sheets 2 thru 5, show internal circuitry of the TCTM, used in the pack temperature control tests.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Air Cycle Pack Control system. It gives the access/area of each component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed discussion of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Referenced Procedures

21-00-00 Air Conditioning System - Fault Isolation

21-64-00 Built-In System Test - Fault Isolation

3. Fault Isolation/Identification

Table 101 is a list of fault isolation data in this section of the manual.

TABLE 101

	FIGURE	TITLE
	101	Component Location Index
	102	Component Locator Diagram
	103	TURB BYP or RAM AIR Valve Fault
	104	Humidity Control Problems
R	105	Pack Door Rumble In Flight
	SCHEM 1	No. 1 Pack Auto/Manual Control Schematic
	SCHEM 2	No. 2 Pack Auto/Manual Control Schematic
	SCHEM 3	No. 3 Pack Auto/Manual Control Schematic
	SCHEM 4	Pack Control Test Modes Schematic

A. Procedure

(1) Perform fault isolation/identification procedure for self-test of TCTM (Ref. 21-64-00).

(2) Perform BITE and fault isolation/identification procedures for air cycle pack control system components and circuits by following procedure detailed on TCTM flip charts, using schematics for fault isolation as pertinent.

(3) Repair aircraft circuits or replace faulty component as required.

COMPONENT	QTY	AREA/ACCESS	REFERENCE
ACTUATOR – RAM AIR EXHAUST VALVE	3	HX COMPTS; 115AL-1, 116AR-1 116BR-1	21-62-04
CAPACITOR MODULE (2162-A16)	1	FESC, DISCONNECT RELAY PANEL,UNDER RIGHT ELECTRICAL RACK; 112AB	•
CAPACITOR MODULE (2162-A19)	1	FESC, DISCONNECT RELAY PANEL,UNDER RIGHT ELECTRICAL RACK; 112AB	•
CAPACITOR MODULE (2162-A22)	1	FESC, DISCONNECT RELAY PANEL,UNDER RIGHT ELECTRICAL RACK; 112AB	•
CIRCUIT BREAKERS			
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1 (2121-CB1)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1), (H3); 210	• •
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 2 (2121-CB3)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1), (H4); 210	•
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 3 (2121-CB4)	1	CIRCUIT BREAKER PANEL NO. 1 (CB1), (H5); 210	•
PACK 1 AUTO/MAN-AC (2162-CB1)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V6); 215	•
PACK 1 AUTO/MAN-DC (2162-CB2)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V5); 215	•
PACK 2 AUTO/MAN-AC (2162-CB3)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V8); 215	•
PACK 2 AUTO/MAN-DC (2162-CB4)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V7); 215	•
PACK 3 AUTO/MAN-AC (2162-CB7)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V18); 215	•
PACK 3 AUTO/MAN-DC (2162-CB6)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V17); 215	•
TEMP CONTROL FLT STA-AC (2160-CB8)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V4); 215	•
TEMP CONTROL FLT STA-DC (2160-CB1)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V3); 215	•

*SEE WM EQUIPMENT LIST

M1-0000-21-1279

Component Location Index
Figure 101 (Sheet 1)

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS			
ZONE CENTER TEMPERATURE CONTROL AFT CAB-AC (2160-CB11)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V14); 215	*
ZONE CENTER TEMPERATURE CONTROL AFT CAB-DC (2161-CB4)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V13); 215	*
ZONE CENTER TEMPERATURE CONTROL FWD CAB-AC (2161-CB9)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V10);215	*
ZONE CENTER TEMPERATURE CONTROL FWD CAB-DC (2161-CB2)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V9); 215	*
ZONE CENTER TEMPERATURE CONTROL GALLEY-AC (2160-CB12)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V16); 215	*
ZONE CENTER TEMPERATURE CONTROL GALLEY-DC (2161-CB5)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V15); 215	*
ZONE CENTER TEMPERATURE CONTROL MID CAB-AC (2160-CB10)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V12); 215	*
ZONE CENTER TEMPERATURE CONTROL MID CAB-DC (2161-CB3)	1	CIRCUIT BREAKER PANEL NO. 3 (CB3), (V11); 215	*

*SEE WM EQUIPMENT LIST

M1-0000-21-1281

Component Location Index
Figure 101 (Sheet 2)

COMPONENT	QTY	AREA/ACCESS	REFERENCE
INDICATOR – RAM AIR/TURBINE BYPASS POSITION	6	FE/SO STATION, PANEL P11; 215	21–62–28
LAMPS – SWITCHLIGHT	4	FE/SO STATION, PANEL P11; 215	20–33–01
PACK TEMPERATURE CONTROLLERS			
NO. 1 PACK	1	FESC, RIGHT ELECTRICAL RACK; 112AB	21–62–01
NO. 2 PACK	1	FESC, RIGHT ELECTRICAL RACK; 112AB	21–62–01
NO. 3 PACK	1	FESC, RIGHT ELECTRICAL RACK; 112AB	21–62–01
PANEL – HUMIDITY CONTROL	1	FE/SO STATION, PANEL P12; 215	*
RELAYS			*
HUMIDITY CONTROL RELAY (2199-K3)	1	FE/SO STATION, HUMIDITY CONTROL PANEL; 215	*
HUMIDITY CONTROL RELAY (2199-K4)	1	FE/SO STATION, HUMIDITY CONTROL PANEL; 215	*
PACK 1 COOL RELAY (2162-K3)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 1 RAM AIR EXHAUST RELAY (2162-K5)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 1 TURBINE BYPASS RELAY (2162-K4)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 1 WARM RELAY (2162-K2)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 2 COOL RELAY (2162-K9)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACKS; 112AB	*
PACK 2 RAM AIR EXHAUST RELAY (2162-K12)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 2 TURBINE BYPASS RELAY (2162-K11)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 2 WARM RELAY (2162-K8)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*

*SEE WM EQUIPMENT LIST

M1-0000-21-1290

Component Location Index
Figure 101 (Sheet 3)

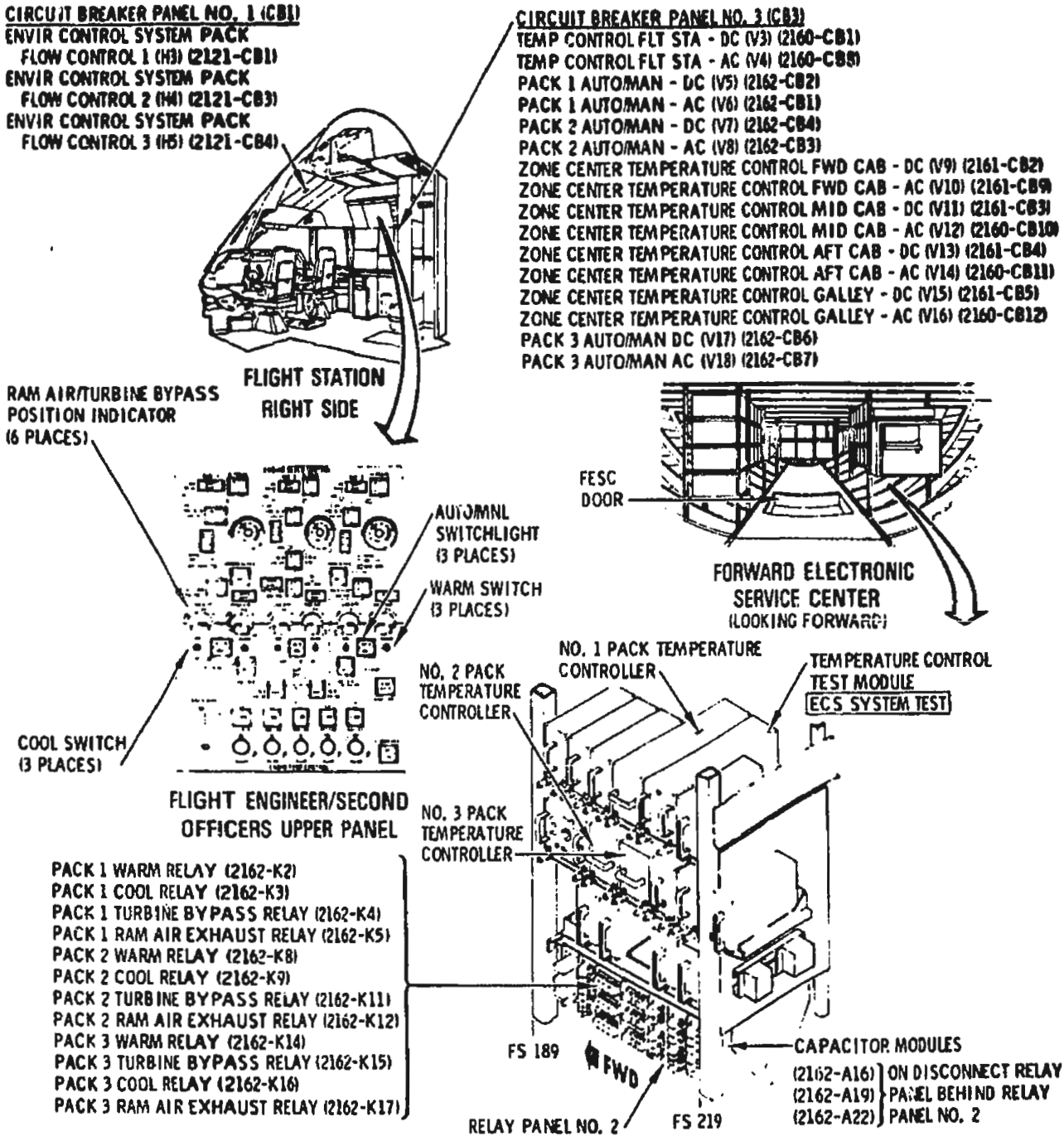
R EFFECTIVITY: ALL
R
001B

COMPONENT	QTY	AREA/ACCESS	REFERENCE
RELAYS			
PACK 3 COOL RELAY (2162-K16)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 3 RAM AIR EXHAUST RELAY (2162-K17)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 3 TURBINE BYPASS RELAY (2162-K15)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
PACK 3 WARM RELAY (2162-K14)	1	FESC, RELAY PANEL, BELOW RIGHT ELECTRICAL RACK; 112AB	*
SENSOR – ACM DISCHARGE	3	ECS COMPTS; 117AL, 118CR	21-62-22
SEPARATOR – WATER	3	ECS COMPTS; 117AL, 118CR	21-51-22
SWITCHLIGHTS			
AUTO/MNL	3	FE/SO STATION, PANEL P11; 215	20-33-01
HUMIDITY CONTROL	1	FE/SO STATION, PANEL P12; 215	20-33-01
SWITCHES			*
COOL (2162-S2, S4, S6)	3	FE/SO STATION, PANEL P11; 215	*
WARM (2162-S1, S3, S5)	3	FE/SO STATION, PANEL P11; 215	*
VALVE – TURBINE BYPASS	3	LH AND RH ECS COMPTS; 117AL, 118CR	21-62-16

*SEE WM EQUIPMENT LIST

M1-0000-21-1292

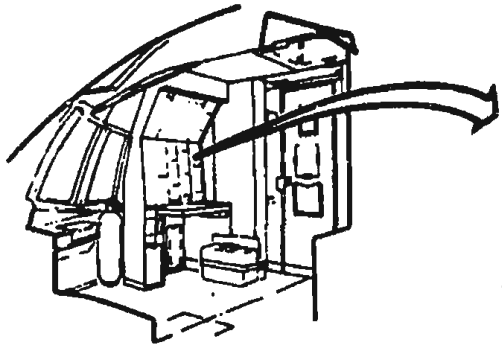
Component Location Index
Figure 101 (Sheet 4)


CIRCUIT BREAKER PANEL NO. 1 (CB1)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1 (H3) (2121-CB1)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 2 (H4) (2121-CB3)
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 3 (H5) (2121-CB4)
CIRCUIT BREAKER PANEL NO. 3 (CB3)
TEMP CONTROL FLT STA - DC (V3) (2160-CB1)
TEMP CONTROL FLT STA - AC (V4) (2160-CB8)
PACK 1 AUTO/MAN - DC (V5) (2162-CB2)
PACK 1 AUTO/MAN - AC (V6) (2162-CB1)
PACK 2 AUTO/MAN - DC (V7) (2162-CB4)
PACK 2 AUTO/MAN - AC (V8) (2162-CB3)
ZONE CENTER TEMPERATURE CONTROL FWD CAB - DC (V9) (2161-CB2)
ZONE CENTER TEMPERATURE CONTROL FWD CAB - AC (V10) (2161-CB9)
ZONE CENTER TEMPERATURE CONTROL MID CAB - DC (V11) (2161-CB3)
ZONE CENTER TEMPERATURE CONTROL MID CAB - AC (V12) (2160-CB10)
ZONE CENTER TEMPERATURE CONTROL AFT CAB - DC (V13) (2161-CB4)
ZONE CENTER TEMPERATURE CONTROL AFT CAB - AC (V14) (2160-CB11)
ZONE CENTER TEMPERATURE CONTROL GALLEY - DC (V15) (2161-CB5)
ZONE CENTER TEMPERATURE CONTROL GALLEY - AC (V16) (2160-CB12)
PACK 3 AUTO/MAN DC (V17) (2162-CB6)
PACK 3 AUTO/MAN AC (V18) (2162-CB7)
FLIGHT STATION RIGHT SIDE
RAM AIR/TURBINE BYPASS POSITION INDICATOR (6 PLACES)
AUTO/MNL SWITCHLIGHT (3 PLACES)
WARM SWITCH (3 PLACES)
COOL SWITCH (3 PLACES)
FLIGHT ENGINEER/SECOND OFFICERS UPPER PANEL
FESC DOOR
FORWARD ELECTRONIC SERVICE CENTER (LOOKING FORWARD)
NO. 1 PACK TEMPERATURE CONTROLLER
NO. 2 PACK TEMPERATURE CONTROLLER
NO. 3 PACK TEMPERATURE CONTROLLER
TEMPERATURE CONTROL TEST MODULE
ECS SYSTEM TEST
PACK 1 WARM RELAY (2162-K2)
PACK 1 COOL RELAY (2162-K3)
PACK 1 TURBINE BYPASS RELAY (2162-K4)
PACK 1 RAM AIR EXHAUST RELAY (2162-K5)
PACK 2 WARM RELAY (2162-K8)
PACK 2 COOL RELAY (2162-K9)
PACK 2 TURBINE BYPASS RELAY (2162-K11)
PACK 2 RAM AIR EXHAUST RELAY (2162-K12)
PACK 3 WARM RELAY (2162-K14)
PACK 3 TURBINE BYPASS RELAY (2162-K15)
PACK 3 COOL RELAY (2162-K16)
PACK 3 RAM AIR EXHAUST RELAY (2162-K17)
FS 189
FWD
RELAY PANEL NO. 2
FS 219
CAPACITOR MODULES
(2162-A16) ON DISCONNECT RELAY PANEL BEHIND RELAY PANEL NO. 2
(2162-A19)
(2162-A22)
RIGHT SIDE ELECTRONIC RACK

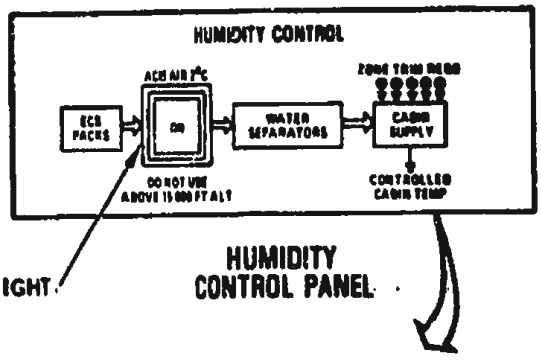
M1-0000-21-1294

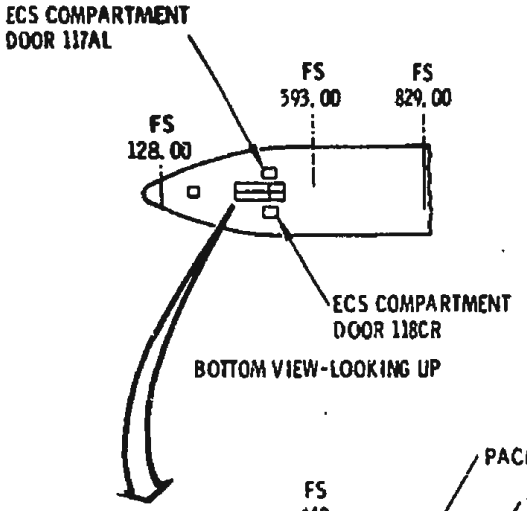
Component Locator Diagram
Figure 102 (Sheet 1)

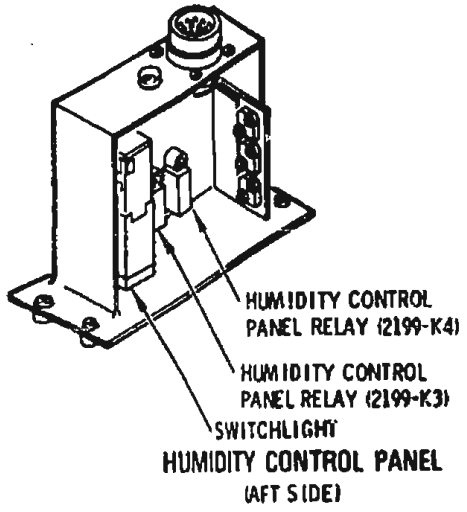
R EFFECTIVITY: ALL
R
001B

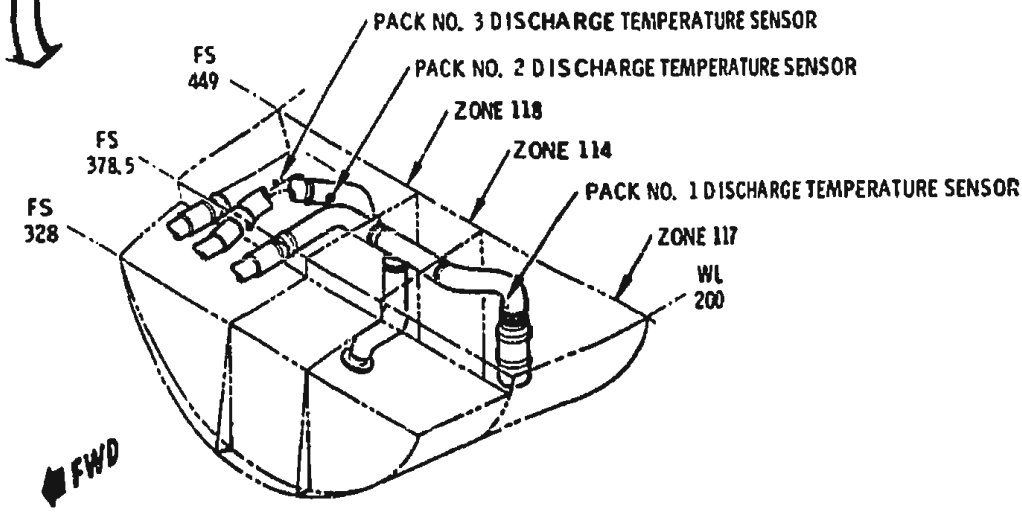


FLIGHT STATION
RIGHT SIDE





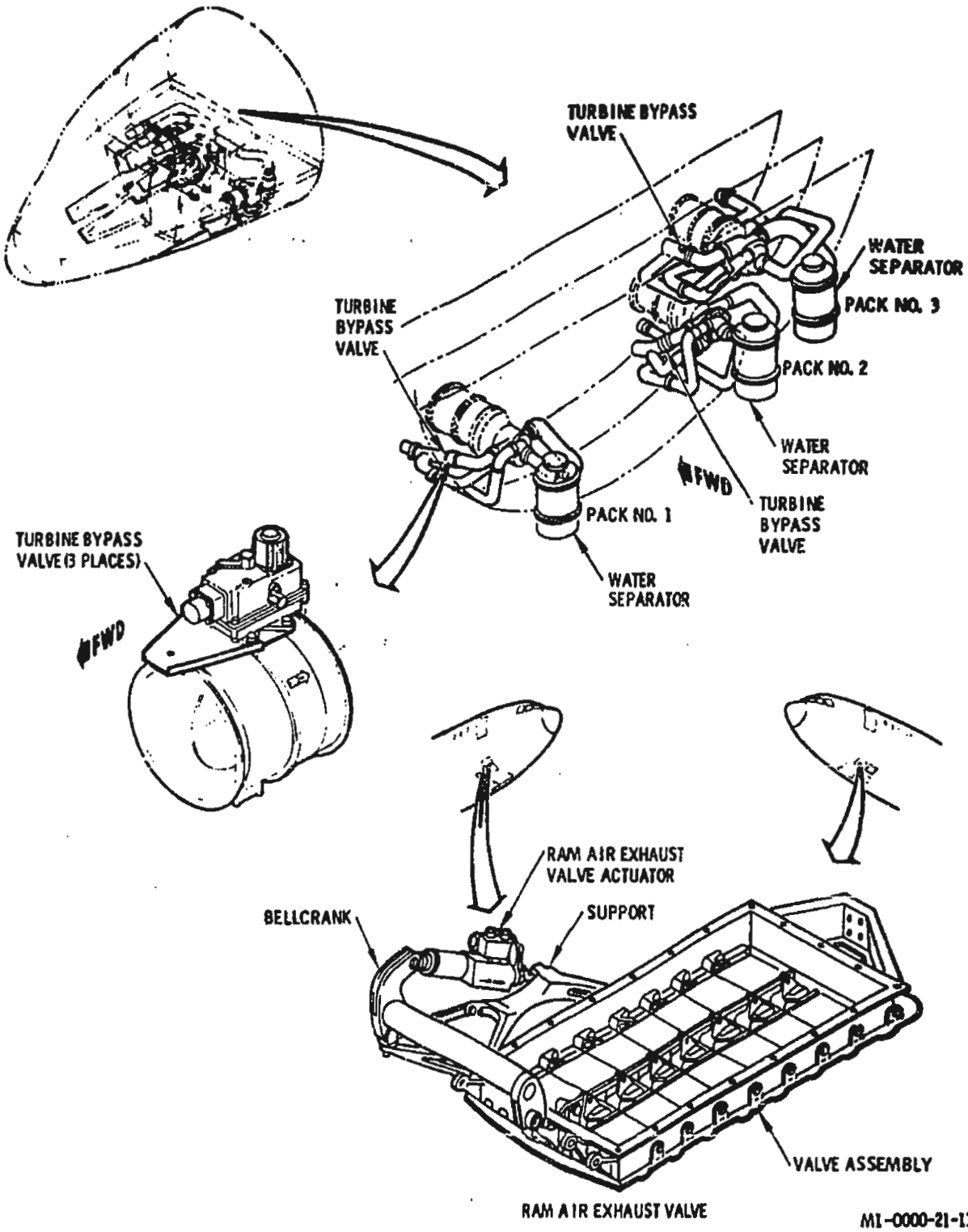




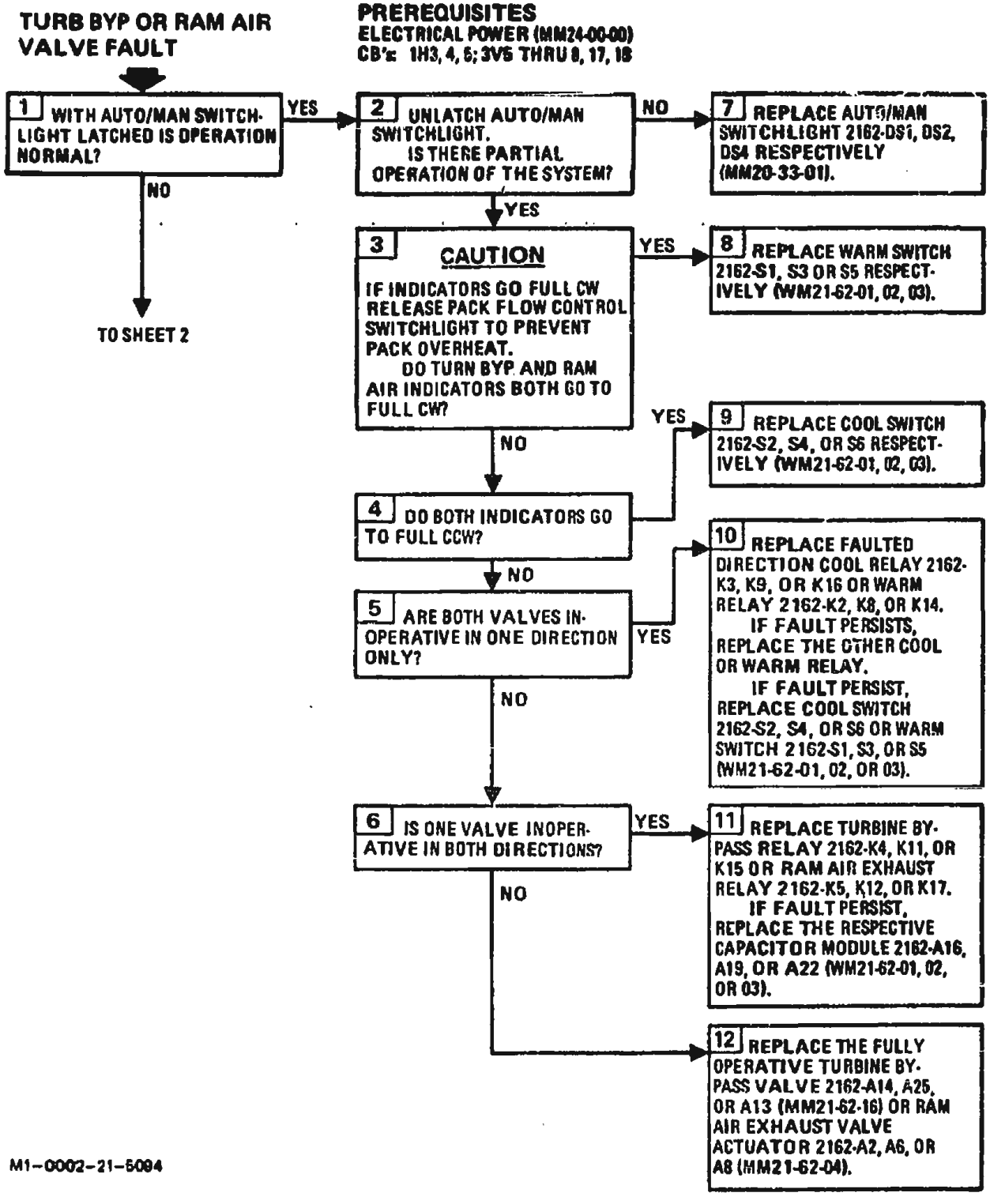
M1-0001-21-1301

Component Locator Diagram
Figure 102 (Sheet 2)

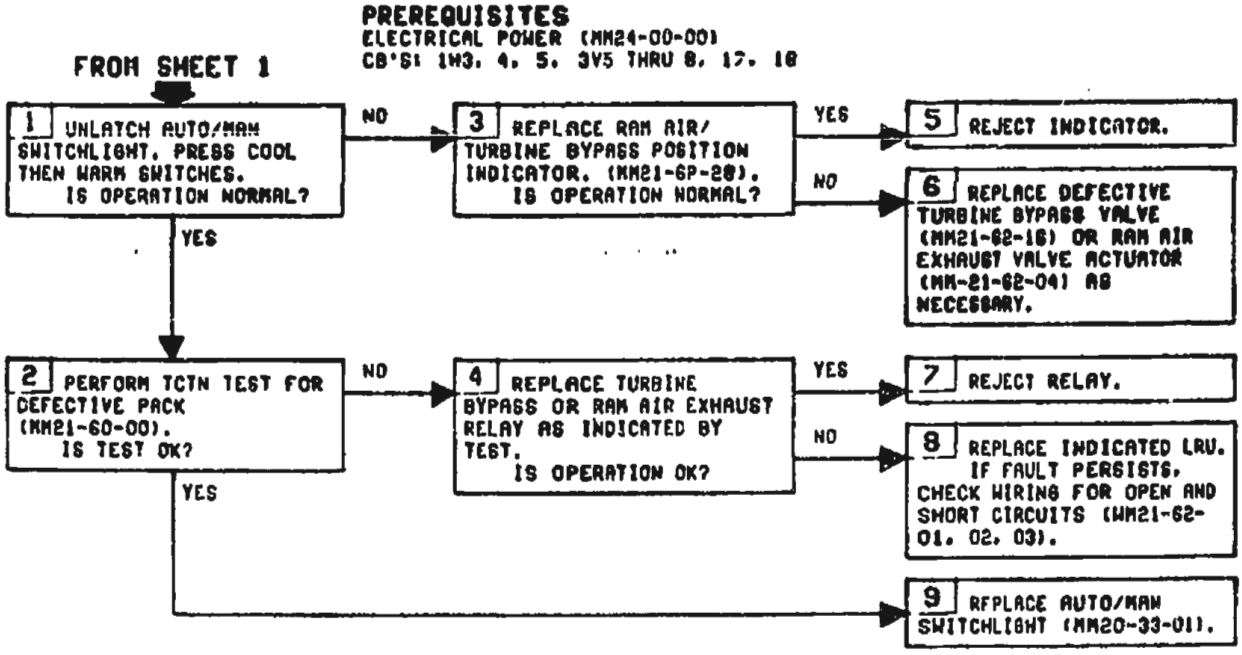
R EFFECTIVITY: ALL
R
0018



Component Locator Diagram
Figure 102 (Sheet 3)

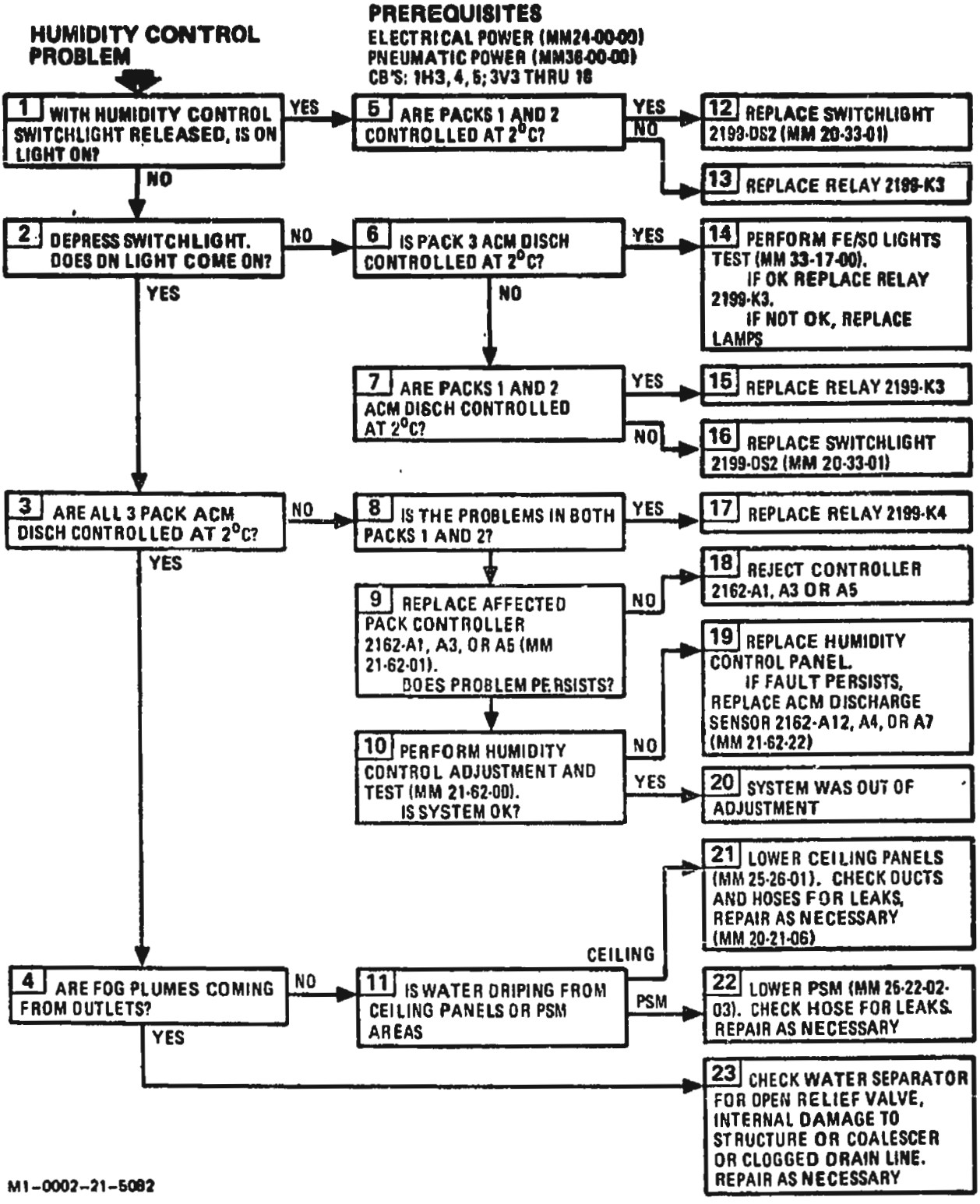

TURB BYP OR RAM AIR VALVE FAULT
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB's: 1H3, 4, 5; 3V5 THRU 8, 17, 18
1 WITH AUTO/MAN SWITCHLIGHT LATCHED IS OPERATION NORMAL?
YES
NO
TO SHEET 2
2 UNLATCH AUTO/MAN SWITCHLIGHT. IS THERE PARTIAL OPERATION OF THE SYSTEM?
NO
7 REPLACE AUTO/MAN SWITCHLIGHT 2162-DS1, DS2, DS4 RESPECTIVELY (MM20-33-01).
YES
3 CAUTION
IF INDICATORS GO FULL CW RELEASE PACK FLOW CONTROL SWITCHLIGHT TO PREVENT PACK OVERHEAT.
DO TURN BYP AND RAM AIR INDICATORS BOTH GO TO FULL CW?
YES
8 REPLACE WARM SWITCH 2162-S1, S3 OR S5 RESPECTIVELY (WM21-62-01, 02, 03).
NO
YES
9 REPLACE COOL SWITCH 2162-S2, S4, OR S6 RESPECTIVELY (WM21-62-01, 02, 03).
4 DO BOTH INDICATORS GO TO FULL CCW?
NO
5 ARE BOTH VALVES INOPERATIVE IN ONE DIRECTION ONLY?
YES
10 REPLACE FAULTED DIRECTION COOL RELAY 2162-K3, K9, OR K16 OR WARM RELAY 2162-K2, K8, OR K14.
IF FAULT PERSISTS, REPLACE THE OTHER COOL OR WARM RELAY.
IF FAULT PERSIST, REPLACE COOL SWITCH 2162-S2, S4, OR S6 OR WARM SWITCH 2162-S1, S3, OR S5 (WM21-62-01, 02, OR 03).
NO
6 IS ONE VALVE INOPERATIVE IN BOTH DIRECTIONS?
YES
11 REPLACE TURBINE BYPASS RELAY 2162-K4, K11, OR K15 OR RAM AIR EXHAUST RELAY 2162-K5, K12, OR K17.
IF FAULT PERSIST, REPLACE THE RESPECTIVE CAPACITOR MODULE 2162-A16, A19, OR A22 (WM21-62-01, 02, OR 03).
NO
12 REPLACE THE FULLY OPERATIVE TURBINE BYPASS VALVE 2162-A14, A25, OR A13 (MM21-62-16) OR RAM AIR EXHAUST VALVE ACTUATOR 2162-A2, A6, OR A8 (MM21-62-04).
M1-0002-21-5094

TURB BYP or RAM AIR Valve Fault
Figure 103 (Sheet 1)


PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
CB'S: 1H3, 4, 5, 3V5 THRU 8, 17, 18
FROM SHEET 1
1 UNLATCH AUTO/MAN SWITCHLIGHT. PRESS COOL THEN WARM SWITCHES. IS OPERATION NORMAL?
NO
3 REPLACE RAM AIR/ TURBINE BYPASS POSITION INDICATOR. (MM21-6P-20). IS OPERATION NORMAL?
YES
5 REJECT INDICATOR.
NO
6 REPLACE DEFECTIVE TURBINE BYPASS VALVE (MM21-62-16) OR RAM AIR EXHAUST VALVE ACTUATOR (MM-21-62-04) AS NECESSARY.
YES
2 PERFORM TCTN TEST FOR DEFECTIVE PACK (MM21-60-00). IS TEST OK?
NO
4 REPLACE TURBINE BYPASS OR RAM AIR EXHAUST RELAY AS INDICATED BY TEST. IS OPERATION OK?
YES
7 REJECT RELAY.
NO
8 REPLACE INDICATED LRU. IF FAULT PERSISTS, CHECK WIRING FOR OPEN AND SHORT CIRCUITS (MM21-62-01, 02, 03).
YES
9 RFPLACE AUTO/MAN SWITCHLIGHT (MM20-33-01).

AI-0001-01-5095

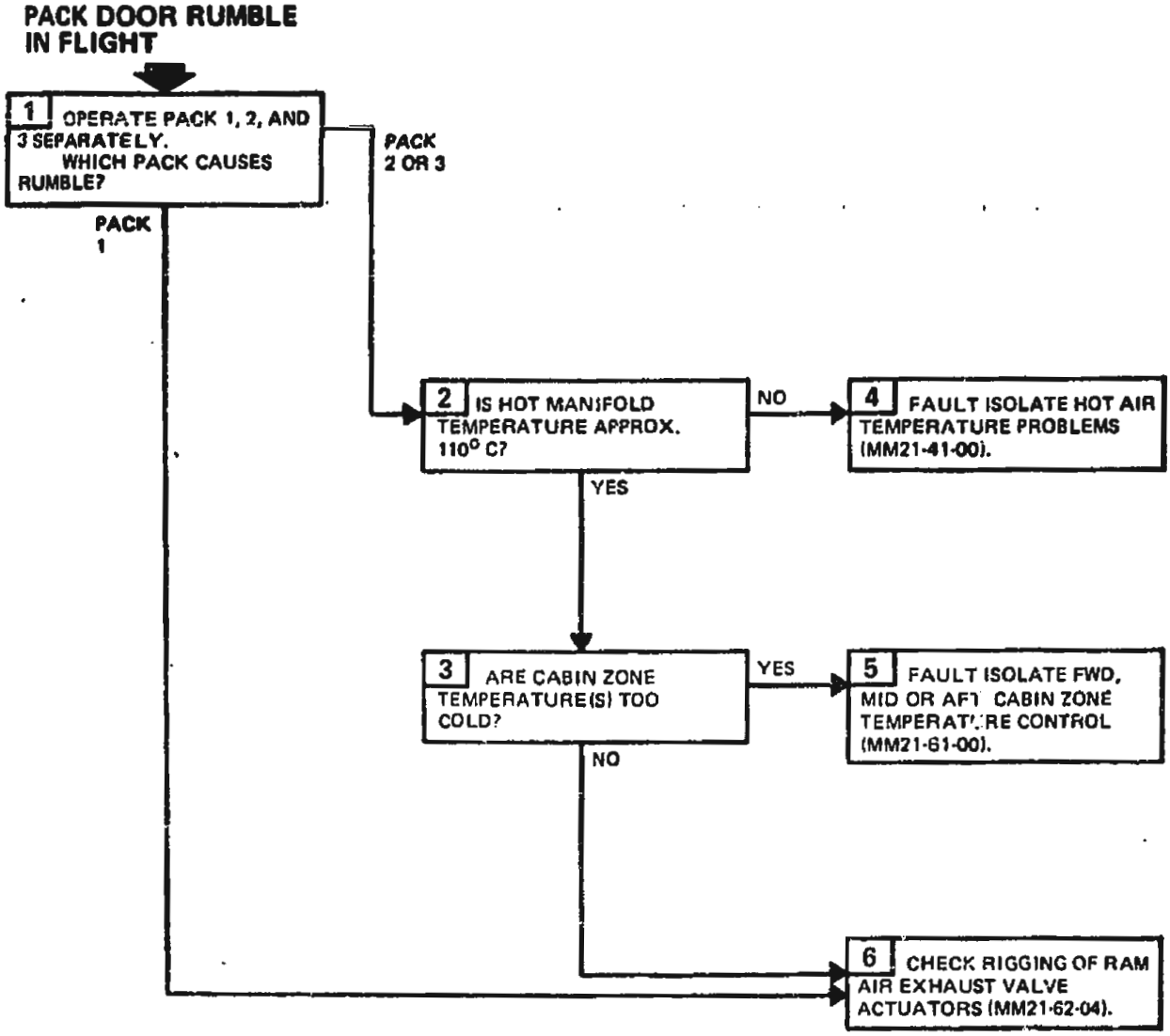
TURB BYP or RAM AIR Valve Fault
Figure 103 (Sheet 2)


HUMIDITY CONTROL PROBLEM
PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC POWER (MM36-00-00)
CB'S: 1H3, 4, 5; 3V3 THRU 16
1 WITH HUMIDITY CONTROL SWITCHLIGHT RELEASED, IS ON LIGHT ON?
YES
NO
2 DEPRESS SWITCHLIGHT. DOES ON LIGHT COME ON?
NO
YES
3 ARE ALL 3 PACK ACM DISCH CONTROLLED AT 2°C?
NO
YES
4 ARE FOG PLUMES COMING FROM OUTLETS?
NO
YES
5 ARE PACKS 1 AND 2 CONTROLLED AT 2°C?
YES
NO
12 REPLACE SWITCHLIGHT 2199-DS2 (MM 20-33-01)
13 REPLACE RELAY 2199-K3
6 IS PACK 3 ACM DISCH CONTROLLED AT 2°C?
YES
NO
14 PERFORM FE/SO LIGHTS TEST (MM 33-17-00). IF OK REPLACE RELAY 2199-K3. IF NOT OK, REPLACE LAMPS
7 ARE PACKS 1 AND 2 ACM DISCH CONTROLLED AT 2°C?
YES
NO
15 REPLACE RELAY 2199-K3
16 REPLACE SWITCHLIGHT 2199-DS2 (MM 20-33-01)
8 IS THE PROBLEMS IN BOTH PACKS 1 AND 2?
YES
NO
17 REPLACE RELAY 2199-K4
18 REJECT CONTROLLER 2162-A1, A3 OR A5
9 REPLACE AFFECTED PACK CONTROLLER 2162-A1, A3, OR A5 (MM 21-62-01). DOES PROBLEM PERSISTS?
NO
19 REPLACE HUMIDITY CONTROL PANEL. IF FAULT PERSISTS, REPLACE ACM DISCHARGE SENSOR 2162-A12, A4, OR A7 (MM 21-62-22)
10 PERFORM HUMIDITY CONTROL ADJUSTMENT AND TEST (MM 21-62-00). IS SYSTEM OK?
NO
YES
20 SYSTEM WAS OUT OF ADJUSTMENT
11 IS WATER DRIPING FROM CEILING PANELS OR PSM AREAS
CEILING
PSM
21 LOWER CEILING PANELS (MM 25-26-01). CHECK DUCTS AND HOSES FOR LEAKS, REPAIR AS NECESSARY (MM 20-21-06)
22 LOWER PSM (MM 25-22-02-03). CHECK HOSE FOR LEAKS. REPAIR AS NECESSARY
23 CHECK WATER SEPARATOR FOR OPEN RELIEF VALVE, INTERNAL DAMAGE TO STRUCTURE OR COALESCER OR CLOGGED DRAIN LINE. REPAIR AS NECESSARY
M1-0002-21-5082

Humidity Control Problems
Figure 104

R EFFECTIVITY: ALL
R
001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC POWER (MM36-00-00) (ENGINES OR APU)

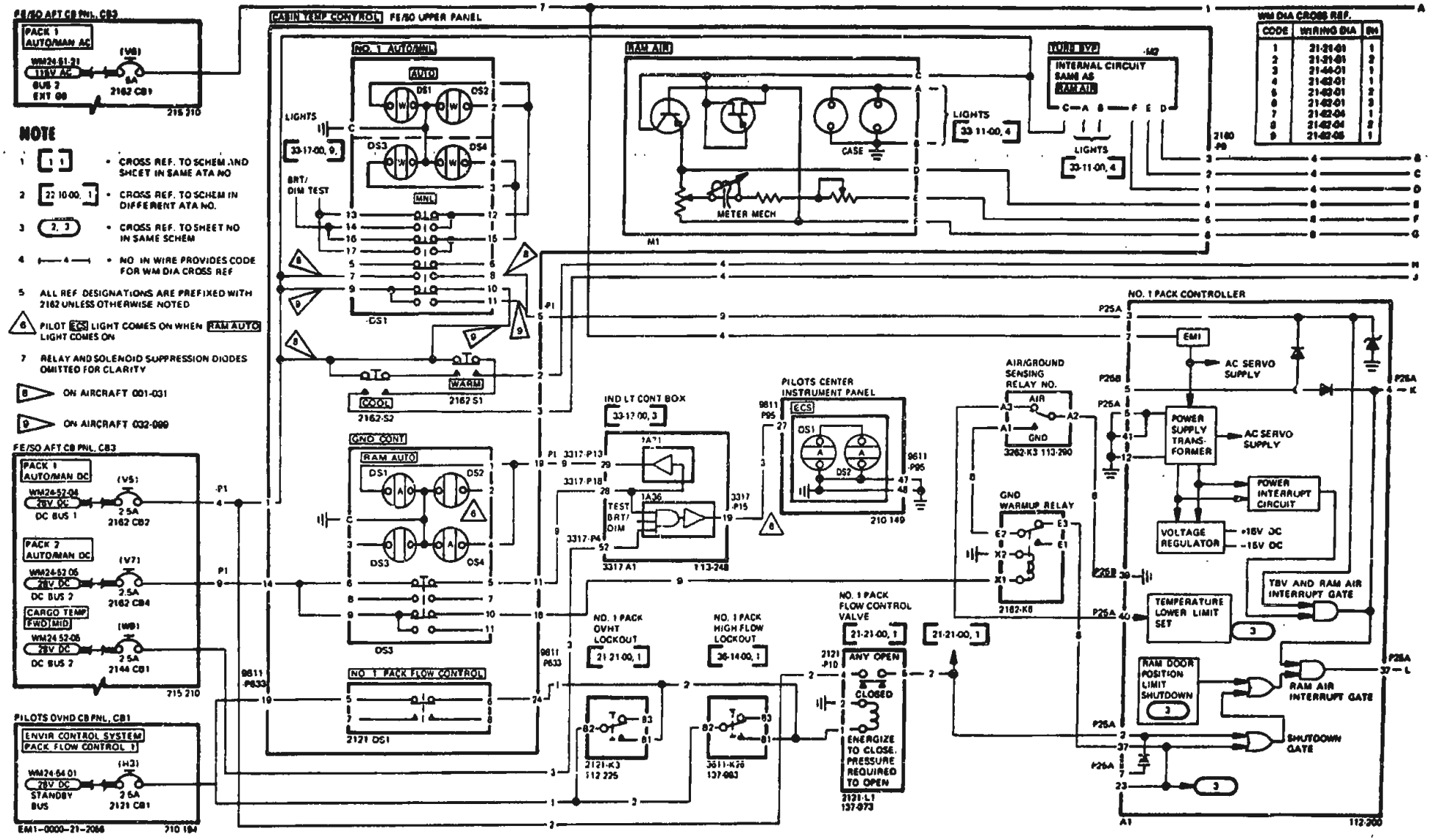

PACK DOOR RUMBLE IN FLIGHT
1 OPERATE PACK 1, 2, AND 3 SEPARATELY. WHICH PACK CAUSES RUMBLE?
PACK 2 OR 3
PACK 1
2 IS HOT MANIFOLD TEMPERATURE APPROX. 110° C?
NO
4 FAULT ISOLATE HOT AIR TEMPERATURE PROBLEMS (MM21-41-00).
YES
3 ARE CABIN ZONE TEMPERATURE(S) TOO COLD?
YES
5 FAULT ISOLATE FWD, MID OR AFT CABIN ZONE TEMPERATURE CONTROL (MM21-61-00).
NO
6 CHECK RIGGING OF RAM AIR EXHAUST VALVE ACTUATORS (MM21-62-04).

M1-0001-21-2265

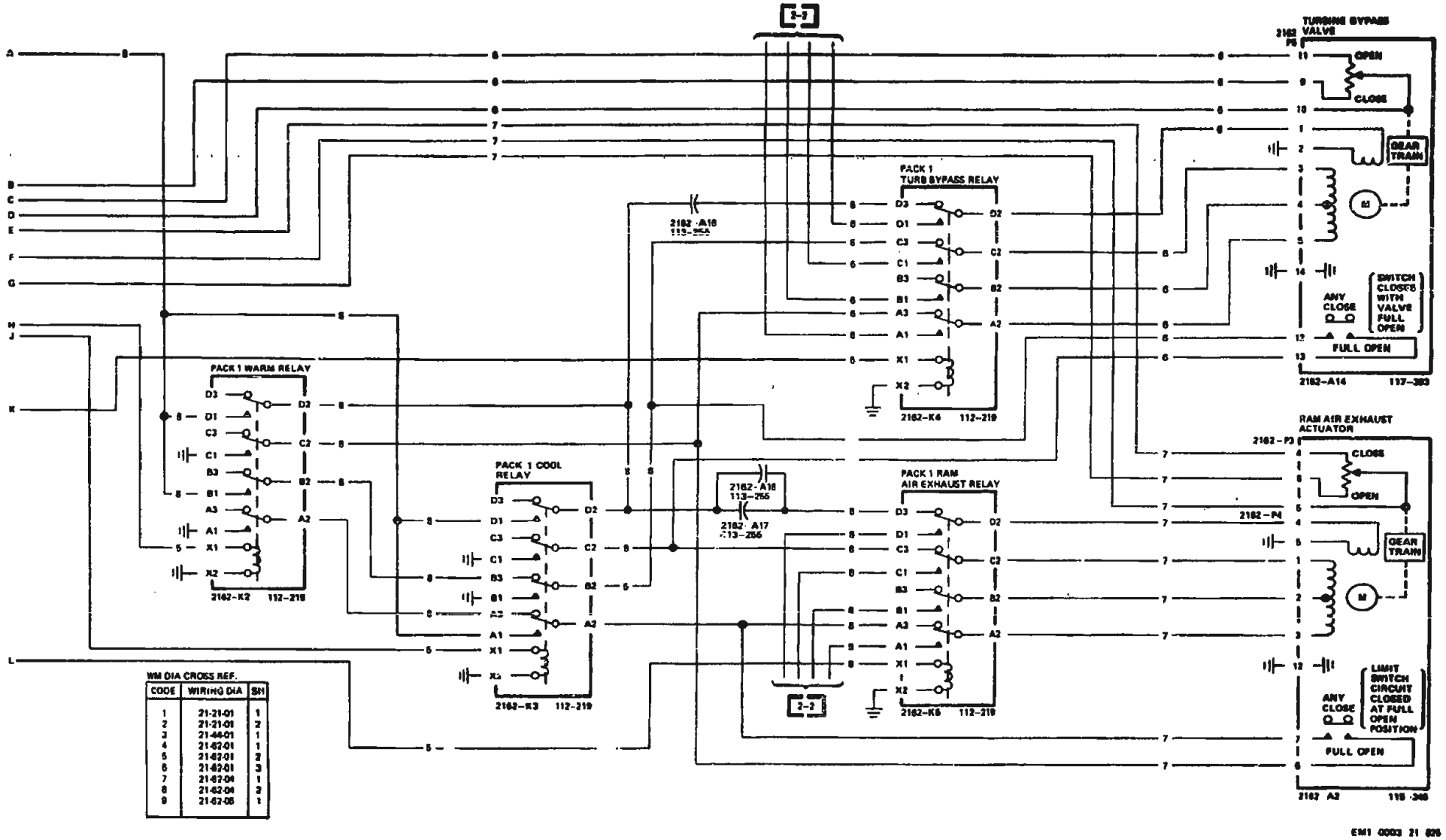
R Pack Door Rumble In Flight
R Figure 105

EFFECTIVITY: ALL

001B

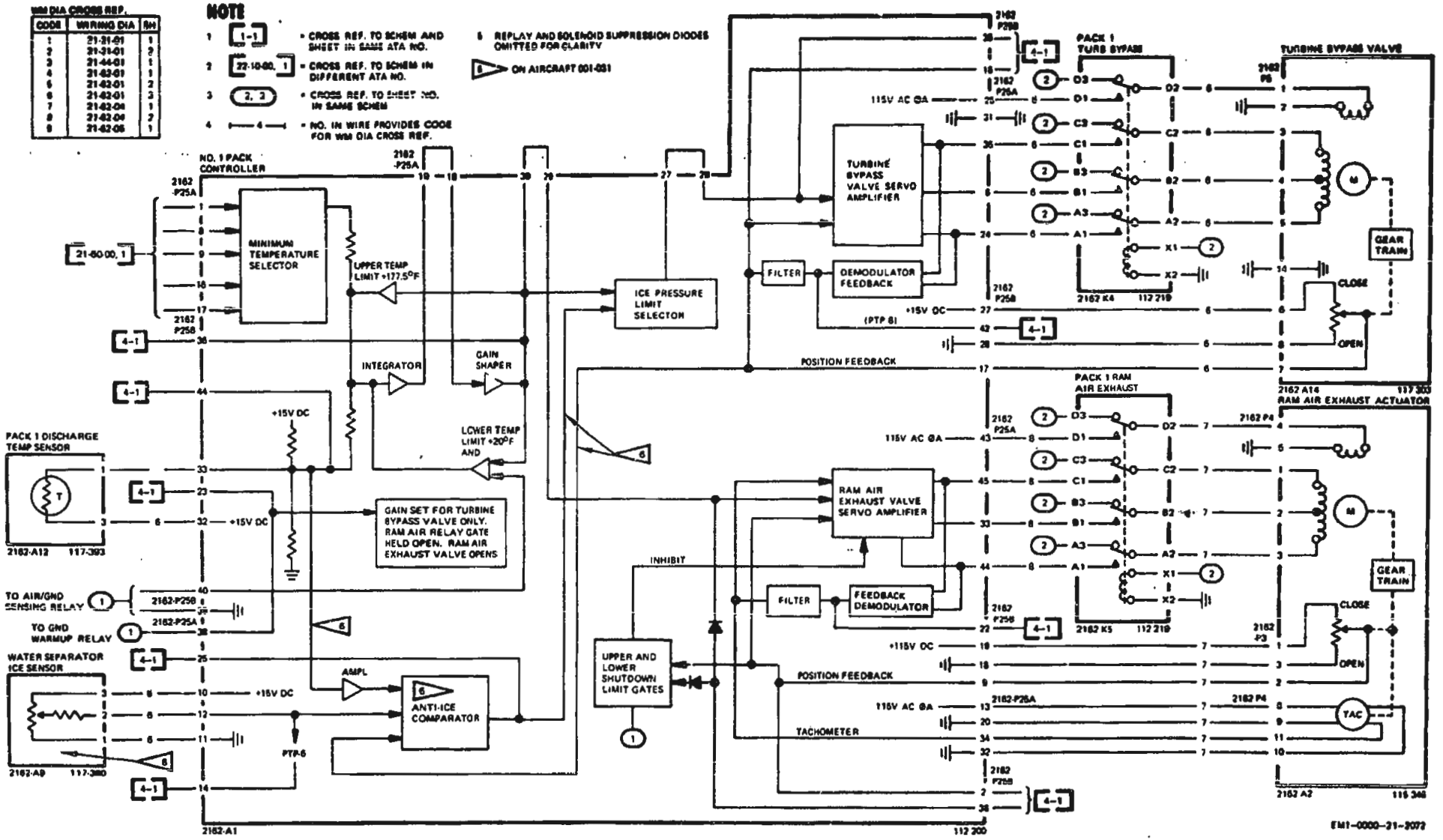

NOTE
1 [1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO
2 [22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) • CROSS REF. TO SHEET NO IN SAME SCHEM
4 —4— • NO IN WIRE PROVIDES CODE FOR WM DIA CROSS REF
5 ALL REF DESIGNATIONS ARE PREFIXED WITH 2162 UNLESS OTHERWISE NOTED
6 PILOT ECS LIGHT COMES ON WHEN RAM AUTO LIGHT COMES ON
7 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
8 ON AIRCRAFT 001-031
9 ON AIRCRAFT 032-099
FE/SO AFT CB PNL, CB3
PACK 1 AUTO/MAN AC
PACK 1 AUTO/MAN DC
PACK 2 AUTO/MAN DC
CARGO TEMP FWD MID
PILOTS OVHD CB PNL, CB1
ENVIR CONTROL SYSTEM PACK FLOW CONTROL 1
CABIN TEMP CONTROL
FE/SO UPPER PANEL
NO. 1 AUTO/MNL
RAM AIR
TURB TYP
INTERNAL CIRCUIT SAME AS RAM AIR
WM DIA CROSS REF.
CODE
WIRING DIA
BRT/DIM TEST
LIGHTS
METER MECH
CASE
GND CONT
RAM AUTO
NO. 1 PACK FLOW CONTROL
IND LT CONT BOX
PILOTS CENTER INSTRUMENT PANEL
AIR/GROUND SENSING RELAY NO.
GND WARMUP RELAY
NO. 1 PACK CONTROLLER
EMI
AC SERVO SUPPLY
POWER SUPPLY TRANSFORMER
POWER INTERRUPT CIRCUIT
VOLTAGE REGULATOR
+15V DC
-15V DC
TBV AND RAM AIR INTERRUPT GATE
TEMPERATURE LOWER LIMIT SET
RAM DOOR POSITION LIMIT SHUTDOWN
RAM AIR INTERRUPT GATE
SHUTDOWN GATE
NO. 1 PACK OVHT LOCKOUT
NO. 1 PACK HIGH FLOW LOCKOUT
NO. 1 PACK FLOW CONTROL VALVE
ANY OPEN
CLOSED
ENERGIZE TO CLOSE. PRESSURE REQUIRED TO OPEN

No. 1 Pack Auto/Manual Control Schematic
SCHEM 1 (Sheet 1)



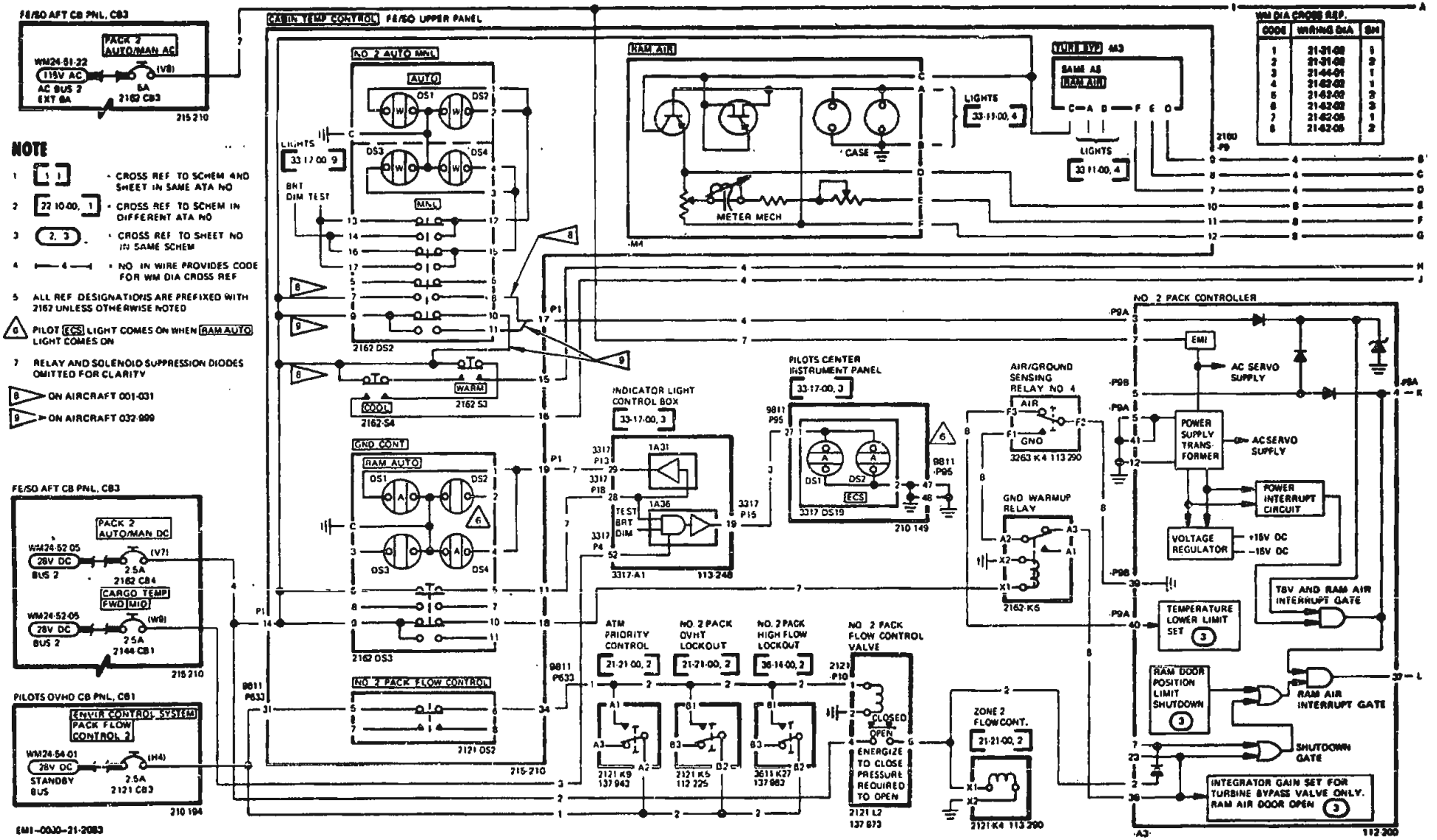
No. 1 Pack Auto/Manual Control Schematic
SCHEM 1 (Sheet 2)

R
R
0018 EFFECTIVITY: ALL


WM DIA CROSS REF.
CODE | WIRING DIA | AH
NOTE
1 [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 2) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4 —4— - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 REPLAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
6 ON AIRCRAFT 001-031
NO. 1 PACK CONTROLLER
MINIMUM TEMPERATURE SELECTOR
UPPER TEMP LIMIT +177.5°F
LOWER TEMP LIMIT +20°F AND
INTEGRATOR
GAIN SHAPER
ICE PRESSURE LIMIT SELECTOR
PACK 1 DISCHARGE TEMP SENSOR
WATER SEPARATOR ICE SENSOR
TO AIR/GND SENSING RELAY
TO GND WARMUP RELAY
GAIN SET FOR TURBINE BYPASS VALVE ONLY. RAM AIR RELAY GATE HELD OPEN. RAM AIR EXHAUST VALVE OPENS
ANTI-ICE COMPARATOR
AMPL
PTP-6
+15V DC
115V AC ØA
TURBINE BYPASS VALVE SERVO AMPLIFIER
DEMODULATOR FEEDBACK
FILTER
POSITION FEEDBACK
PACK 1 TURB BYPASS
TURBINE BYPASS VALVE
GEAR TRAIN
CLOSE
OPEN
RAM AIR EXHAUST VALVE SERVO AMPLIFIER
FEEDBACK DEMODULATOR
INHIBIT
UPPER AND LOWER SHUTDOWN LIMIT GATES
PACK 1 RAM AIR EXHAUST
RAM AIR EXHAUST ACTUATOR
TACHOMETER
TAC
2162-A1
112 200
EM1-0000-21-3072

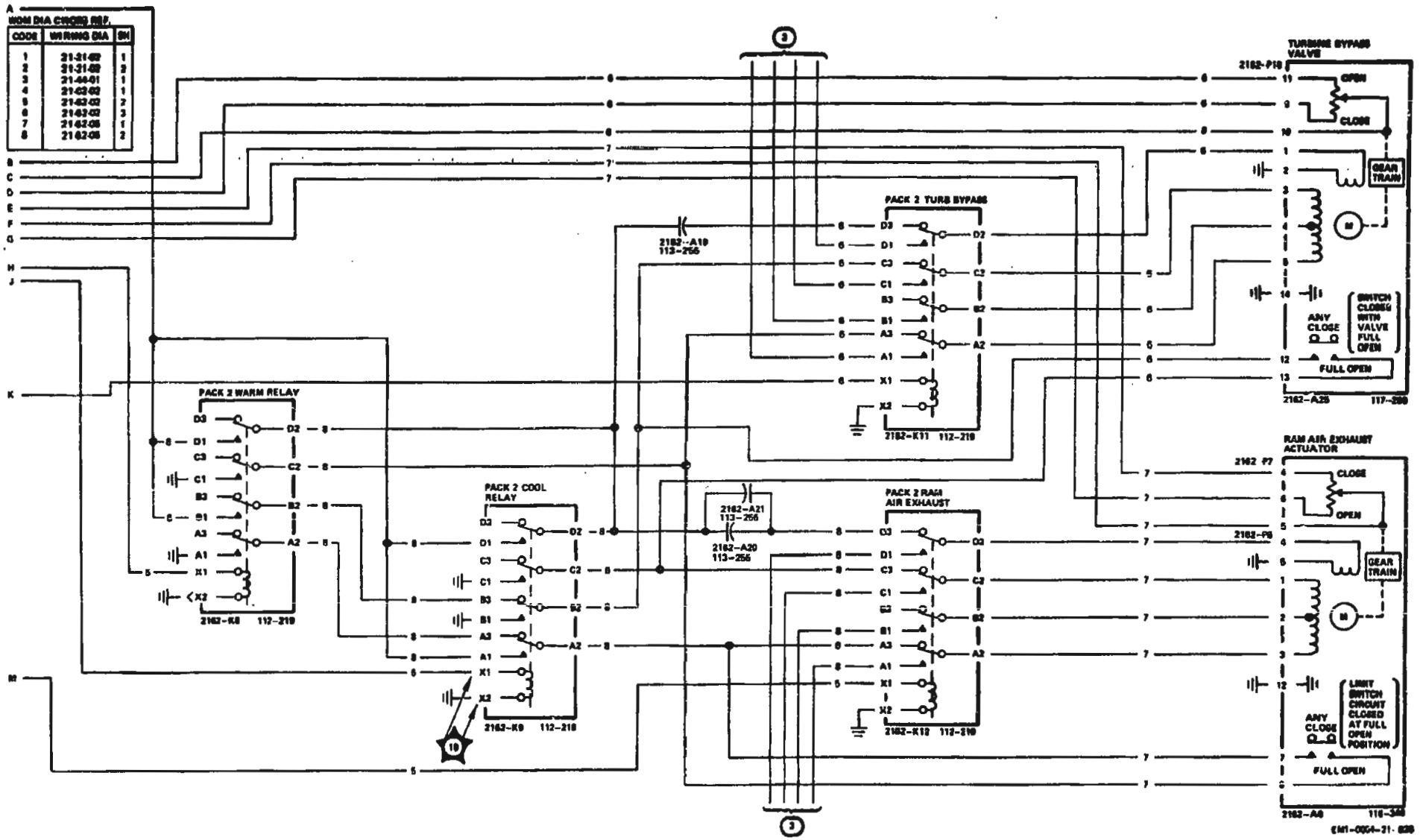
No. 1 Pack Auto/Manual Control Schematic
SCHEM 1 (Sheet 3)

R EFFECTIVITY: ALL
R
001B



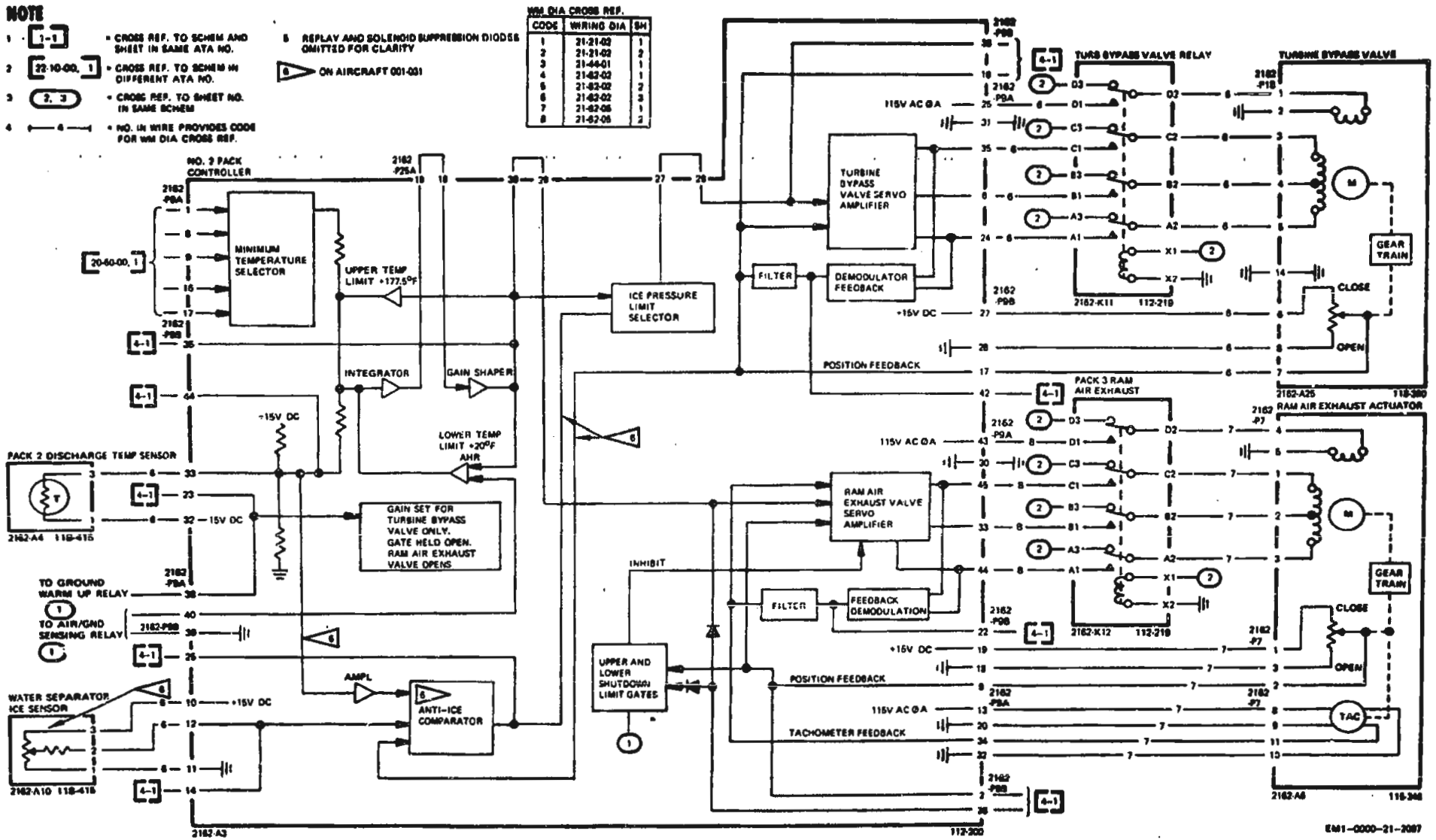
No. 2 Pack Auto/Manual Control Schematic
SCHEM 2 (Sheet 1)

R EFFECTIVITY: ALL
R
001B



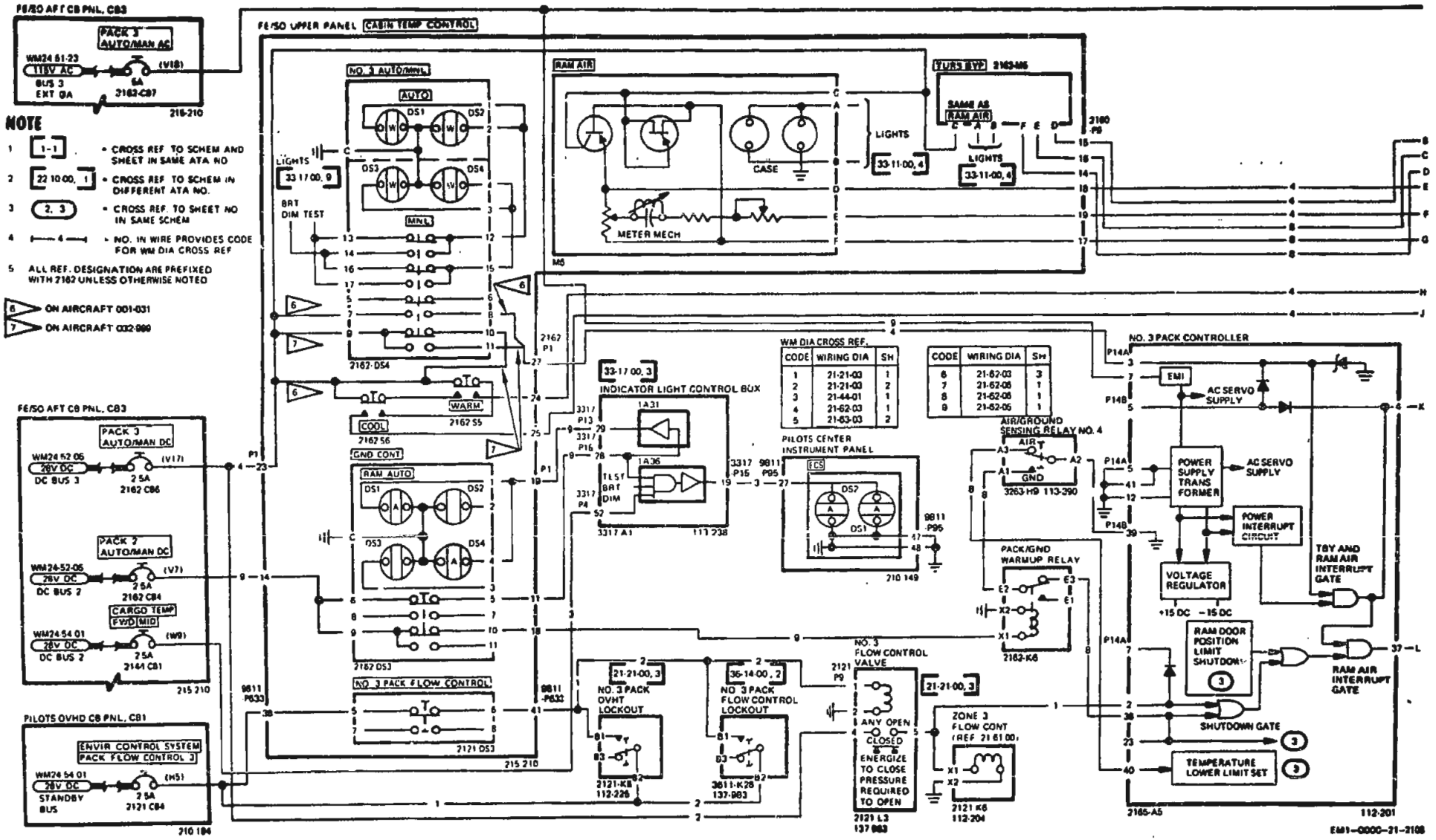
No. 2 Pack Auto/Manual Control Schematic
SCHEM 2 (Sheet 2)

R EFFECTIVITY: ALL
R
001B


NOTE
1 [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 —6— • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
6 ON AIRCRAFT 001-031
WM DIA CROSS REF.
CODE | WIRING DIA | SH
1 | 21-21-02 | 1
2 | 21-21-02 | 2
3 | 21-44-01 | 1
4 | 21-62-02 | 1
5 | 21-62-02 | 2
6 | 21-62-02 | 3
7 | 21-62-05 | 1
8 | 21-62-05 | 2
NO. 2 PACK CONTROLLER
MINIMUM TEMPERATURE SELECTOR
UPPER TEMP LIMIT +177.5°F
INTEGRATOR
GAIN SHAPER
LOWER TEMP LIMIT +20°F AHR
ICE PRESSURE LIMIT SELECTOR
GAIN SET FOR TURBINE BYPASS VALVE ONLY. GATE HELD OPEN. RAM AIR EXHAUST VALVE OPENS
PACK 2 DISCHARGE TEMP SENSOR
2162-A4 118-615
WATER SEPARATOR ICE SENSOR
2162-A10 118-415
TO GROUND WARM UP RELAY
TO AIR/GND SENSING RELAY
AMPL
ANTI-ICE COMPARATOR
UPPER AND LOWER SHUTDOWN LIMIT GATES
INHIBIT
TURBINE BYPASS VALVE SERVO AMPLIFIER
FILTER
DEMODULATOR FEEDBACK
POSITION FEEDBACK
+15V DC
115V AC @A
TURB BYPASS VALVE RELAY
2162-K11 112-219
TURBINE BYPASS VALVE
2162-A25 118-380
PACK 3 RAM AIR EXHAUST
RAM AIR EXHAUST VALVE SERVO AMPLIFIER
FEEDBACK DEMODULATION
2162-K12 112-219
RAM AIR EXHAUST ACTUATOR
2162-A6 118-340
TACHOMETER FEEDBACK
GEAR TRAIN
CLOSE
OPEN
TAC
2162-A3
112-300
EM1-0000-21-2087

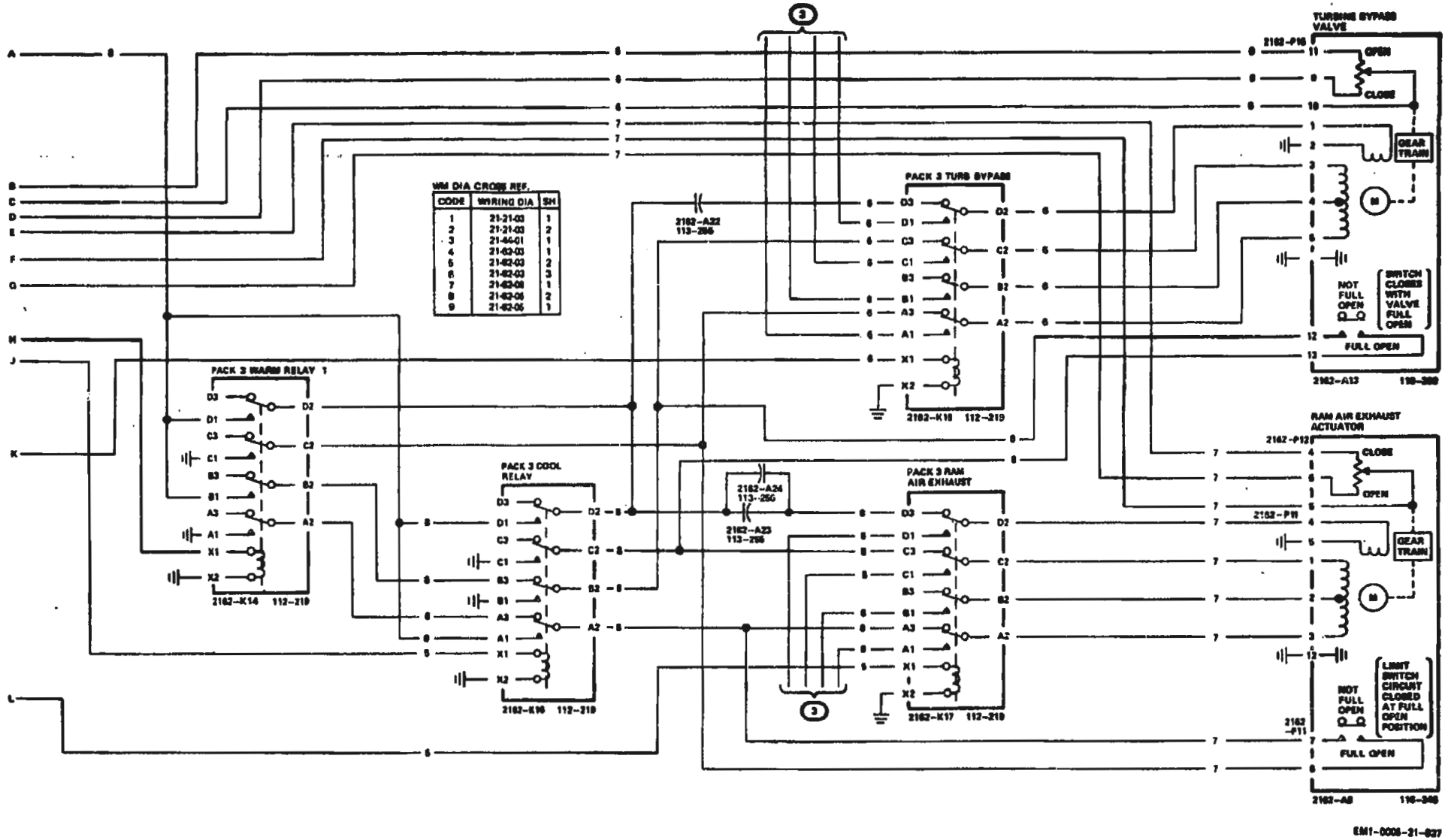
No. 2 Pack Auto/Manual Control Schematic
SCHEM 2 (Sheet 3)

R EFFECTIVITY: ALL
R
001B



No. 3 Pack Auto/Manual Control Schematic
SCHEM 3 (Sheet 1)

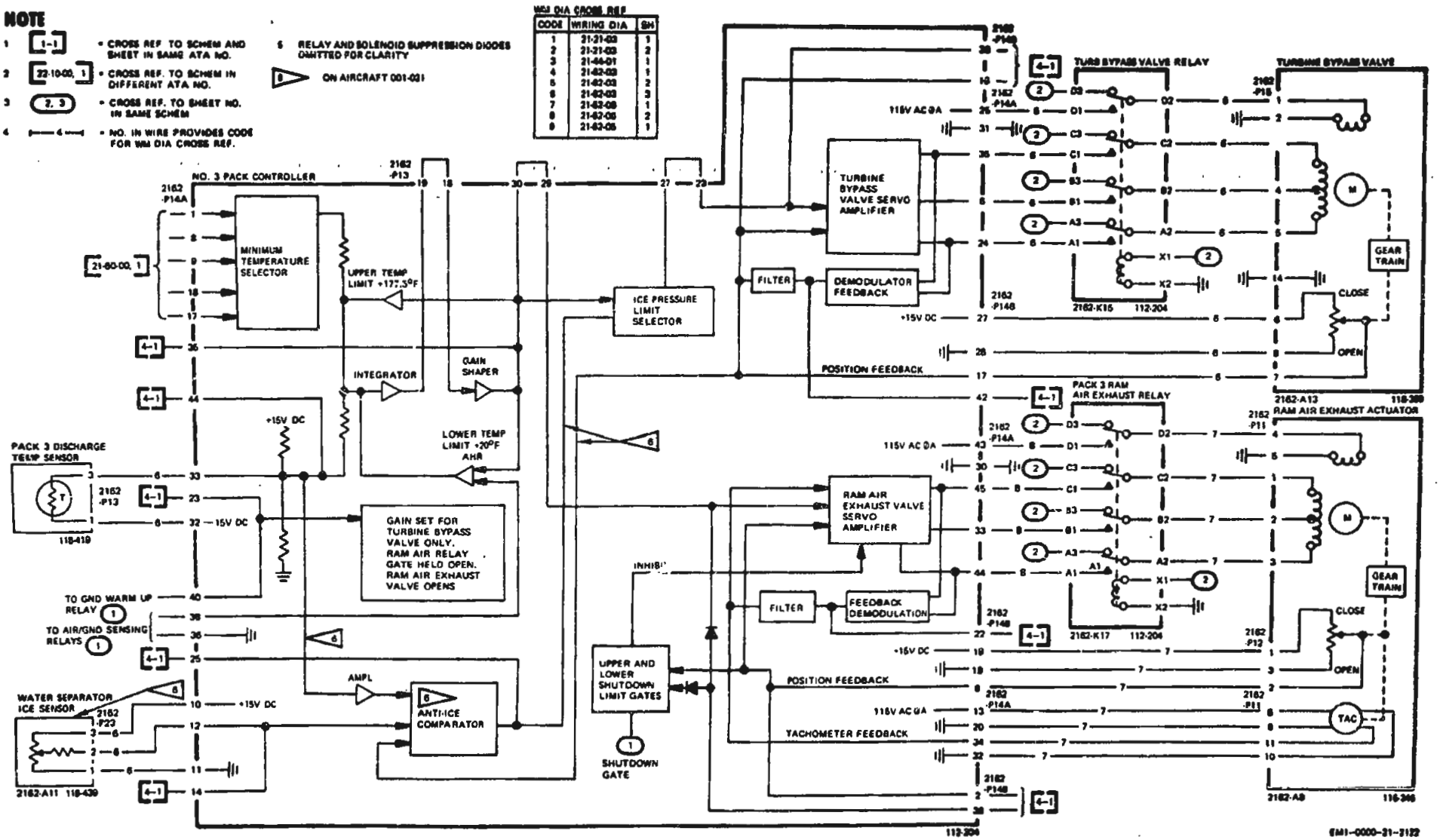
R EFFECTIVITY: ALL
R
001B



No. 3 Pack Auto/Manual Control Schematic
SCHEM 3 (Sheet 2)

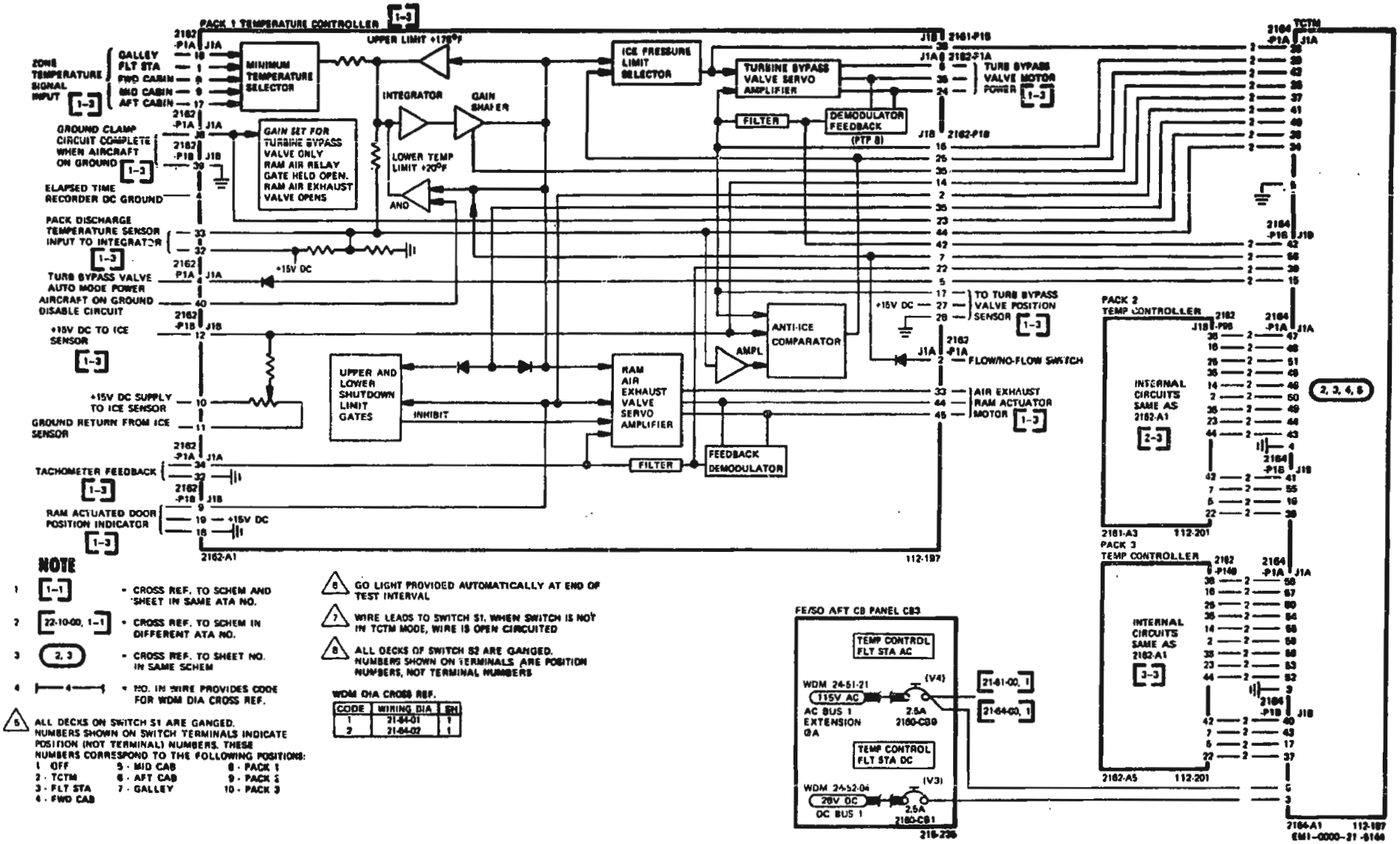
R
R
001B

EFFECTIVITY: ALL


NOTE
1 [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2 [22-10-00, 1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3 (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4 —4— • NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.
5 RELAY AND SOLENOID SUPPRESSION DIODES OMITTED FOR CLARITY
D ON AIRCRAFT 001-031
WM DIA CROSS REF
CODE | WIRING DIA | SH
1 | 21-31-03 | 1
2 | 21-31-03 | 2
3 | 21-44-01 | 1
4 | 21-62-03 | 1
5 | 21-62-03 | 2
6 | 21-62-03 | 3
7 | 21-62-05 | 1
8 | 21-62-05 | 2
9 | 21-62-05 | 1
NO. 3 PACK CONTROLLER
MINIMUM TEMPERATURE SELECTOR
UPPER TEMP LIMIT +177.5°F
LOWER TEMP LIMIT +20°F AHR
INTEGRATOR
GAIN SHAPER
ICE PRESSURE LIMIT SELECTOR
GAIN SET FOR TURBINE BYPASS VALVE ONLY. RAM AIR RELAY GATE HELD OPEN. RAM AIR EXHAUST VALVE OPENS
ANTI-ICE COMPARATOR
AMPL
UPPER AND LOWER SHUTDOWN LIMIT GATES
SHUTDOWN GATE
TURBINE BYPASS VALVE SERVO AMPLIFIER
DEMODULATOR FEEDBACK
FILTER
RAM AIR EXHAUST VALVE SERVO AMPLIFIER
FEEDBACK DEMODULATION
TURB BYPASS VALVE RELAY
PACK 3 RAM AIR EXHAUST RELAY
TURBINE BYPASS VALVE
RAM AIR EXHAUST ACTUATOR
GEAR TRAIN
CLOSE
OPEN
TAC
PACK 3 DISCHARGE TEMP SENSOR
WATER SEPARATOR ICE SENSOR
TO GND WARM UP RELAY
TO AIR/GND SENSING RELAYS
+15V DC
115V AC 0A
POSITION FEEDBACK
TACHOMETER FEEDBACK
INHIBIT
2162-A11 118-439
2162-A13 118-389
2162-A9 118-366
2162-K15 112-204
2162-K17 112-204
112-304
EMI-0000-21-2122

No. 3 Pack Auto/Manual Control Schematic
SCHEM 3 (Sheet 3)

R EFFECTIVITY: ALL
R
001B



NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1-1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— - NO. IN WIRE PROVIDES CODE FOR WDM DIA CROSS REF.

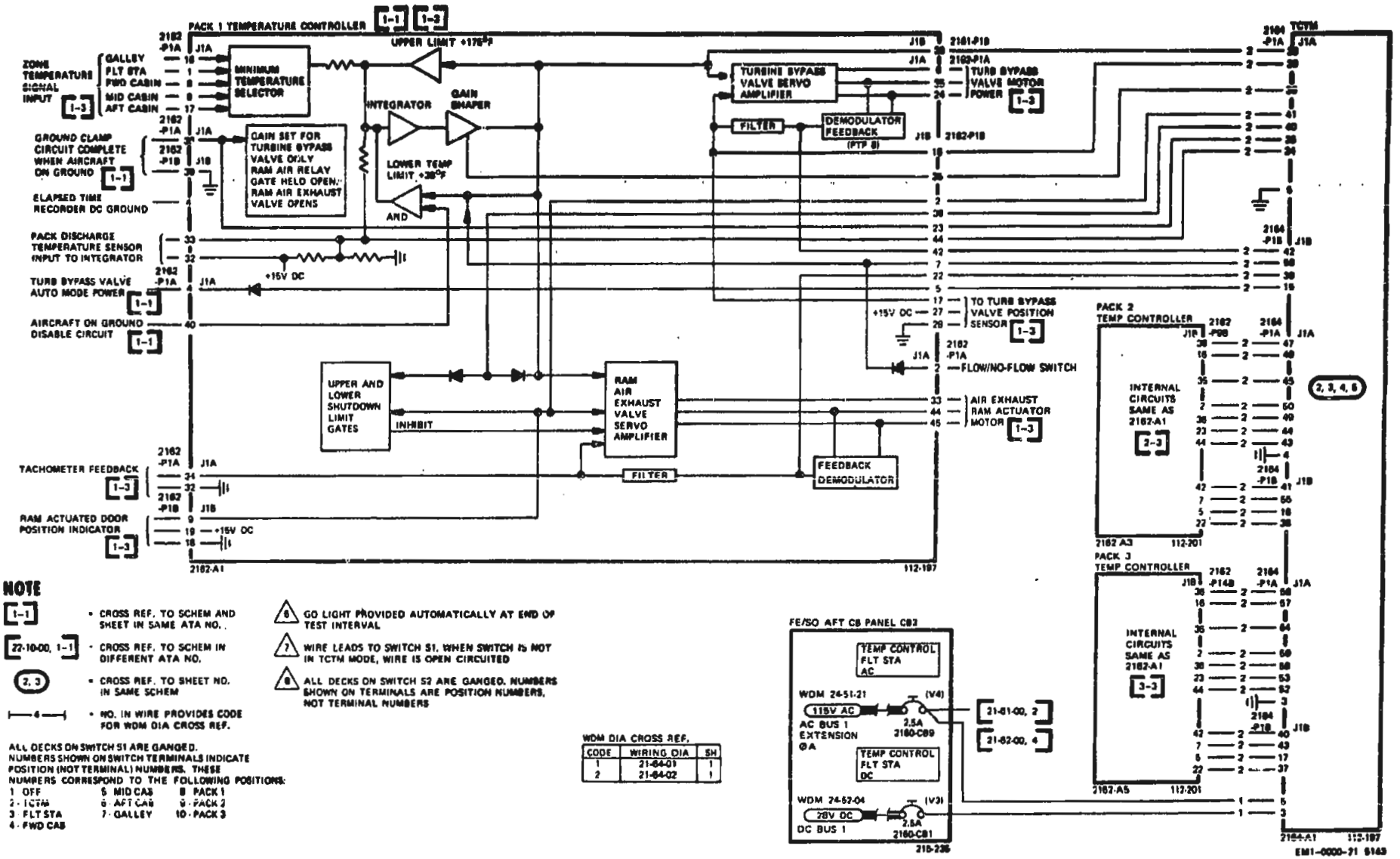
5. ALL DECKS ON SWITCH S1 ARE GANGED. NUMBERS SHOWN ON SWITCH TERMINALS INDICATE POSITION (NOT TERMINAL) NUMBERS. THESE NUMBERS CORRESPOND TO THE FOLLOWING POSITIONS:
   1 - OFF, 2 - TCTM, 3 - FLT STA, 4 - FWD CAB, 5 - MID CAB, 6 - AFT CAB, 7 - GALLEY, 8 - PACK 1, 9 - PACK 2, 10 - PACK 3
6. GO LIGHT PROVIDED AUTOMATICALLY AT END OF TEST INTERVAL
7. WIRE LEADS TO SWITCH S1. WHEN SWITCH IS NOT IN TCTM MODE, WIRE IS OPEN CIRCUITED
8. ALL DECKS OF SWITCH S2 ARE GANGED. NUMBERS SHOWN ON TERMINALS ARE POSITION NUMBERS, NOT TERMINAL NUMBERS

WDM DIA CROSS REF.

CODE	WIRING DIA	SH
1	21-64-01	1
2	21-64-02	1

Pack Control Test Modes Schematic
SCHEM 4 (Sheet 1)

R EFFECTIVITY: WITHOUT SB21-115
R
001B



NOTE

1. [1-1] • CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1-1] • CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) • CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— • NO. IN WIRE PROVIDES CODE FOR WDM DIA CROSS REF.

5. ALL DECKS ON SWITCH S1 ARE GANGED. NUMBERS SHOWN ON SWITCH TERMINALS INDICATE POSITION (NOT TERMINAL) NUMBERS. THESE NUMBERS CORRESPOND TO THE FOLLOWING POSITIONS:
   1 · OFF; 2 · TCTM; 3 · FLT STA; 4 · FWD CAB; 5 · MID CAB; 6 · AFT CAB; 7 · GALLEY; 8 · PACK 1; 9 · PACK 2; 10 · PACK 3
6. GO LIGHT PROVIDED AUTOMATICALLY AT END OF TEST INTERVAL
7. WIRE LEADS TO SWITCH S1, WHEN SWITCH IS NOT IN TCTM MODE, WIRE IS OPEN CIRCUITED
8. ALL DECKS ON SWITCH S2 ARE GANGED. NUMBERS SHOWN ON TERMINALS ARE POSITION NUMBERS, NOT TERMINAL NUMBERS

WDM DIA CROSS REF.

CODE	WIRING DIA	SH
1	21-64-01	1
2	21-64-02	1

Pack Control Test Modes Schematic
SCHEM 4 (Sheet 1)

R EFFECTIVITY: WITH SB21-115
R
001B

S2 POSITION	S1 POSITION: TCTM POSITION 2 (SELF TEST)	TIME DELAY (SEC)	PACK POSITIONS 8 THRU 10 (PACK CONTROLLERS TEST)	TIME DELAY (SEC)
1	NO-GO LIGHT	4.8	FLOW CONTROL VALVE	4.8
2	NO-GO LIGHT	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
3	⑥	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
3	GO LIGHT	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
4	NO-GO LIGHT	47.0	⑥	47.0
4	GO LIGHT	47.0	⑥	47.0
5	⑥	24.6	TURBINE BYPASS VALVE POSITIONING	24.6
6	⑥	4.8	PACT DUCT SENSOR	4.8
7	⑥	24.6	TURBINE BYPASS VALVE GROUND CLAMPS	24.6
8	⑥	4.8	PREPOSITIONING	4.8
9	⑥	24.6	⑥	24.6
10	⑥	4.8	⑥	4.8
11	⑥	47.0	⑥	47.0
12	⑥	4.8	PACK ICE SENSOR	4.8
12	⑥	4.8	⑥	4.8
13	⑥	24.6	ICE CONTROL LOAD	24.6
13	⑥	24.6	⑥	24.6
14	⑥	4.8	⑥	4.8
15	⑥	4.8	RAM ACTUATOR DRIVE	4.8
16	⑥	4.8	RAM ACTUATOR DRIVE	4.8
17	⑥	24.6	RAM POSITIONING	24.6

TABLE 1
SWITCH SELECTION AND FUNCTIONAL TEST

NOTE

1. [1-1] = CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] = CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) = CROSS REF. TO SHEET NO. IN SAME SCHEM
4. —4— = NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.

⑥ GO LIGHT PROVIDED AUTOMATICALLY END OF TEST INTERVAL

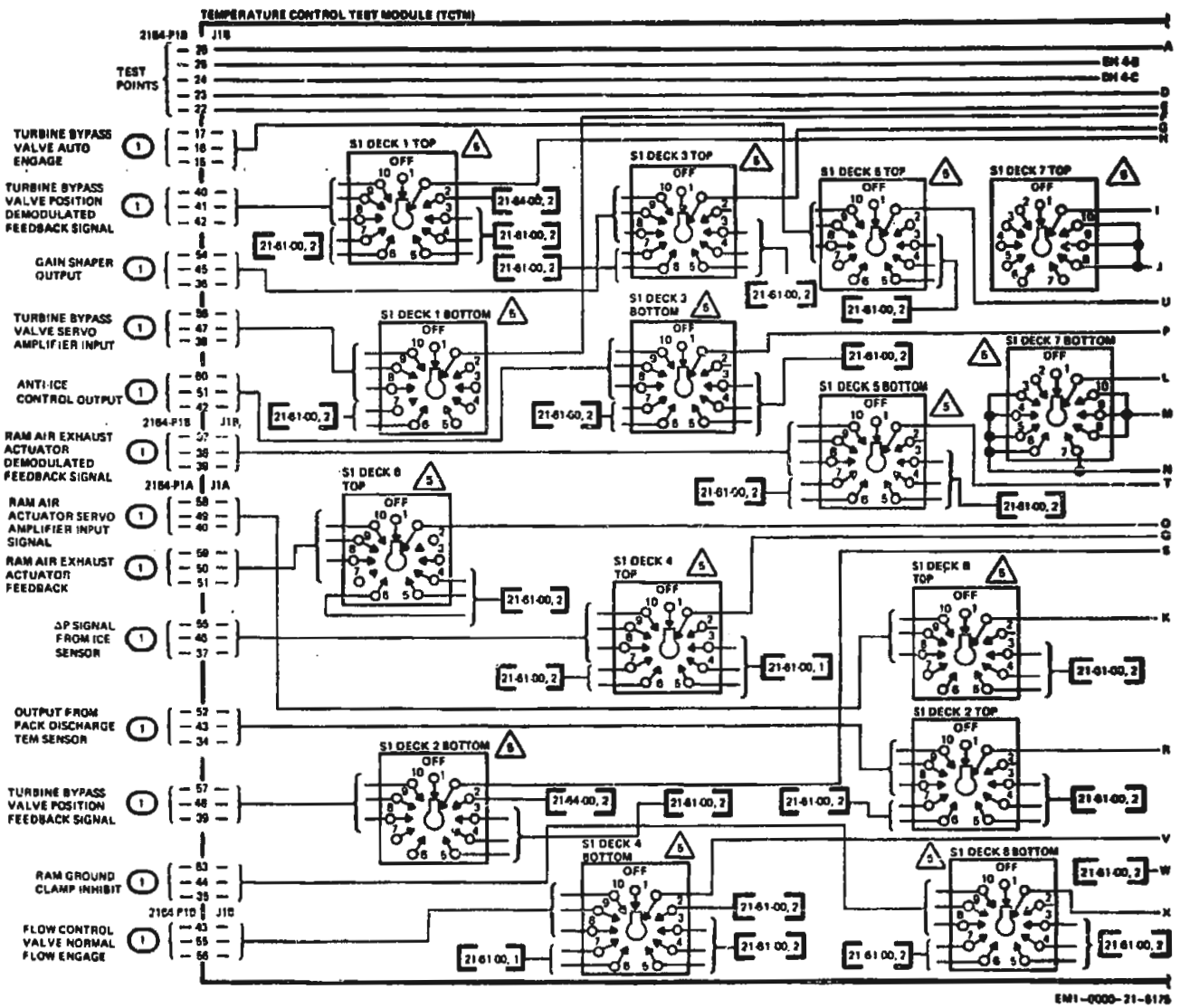
⑤ ALL DECKS OF SWITCH S1 ARE GANGED. NUMBERS SHOWN ON SWITCH TERMINALS INDICATE POSITION (NOT TERMINAL NUMBERS). THESE NUMBERS CORRESPOND TO THE FOLLOWING POSITIONS

1 – OFF
2 – TCTM
3 FLT STA
4 FWD CAB
5 MID CAB
6 – AFT CAB
7 – GALLEY
8 – PACK 1
9 PACK 2
10 PACK 3

EFFECTIVITY

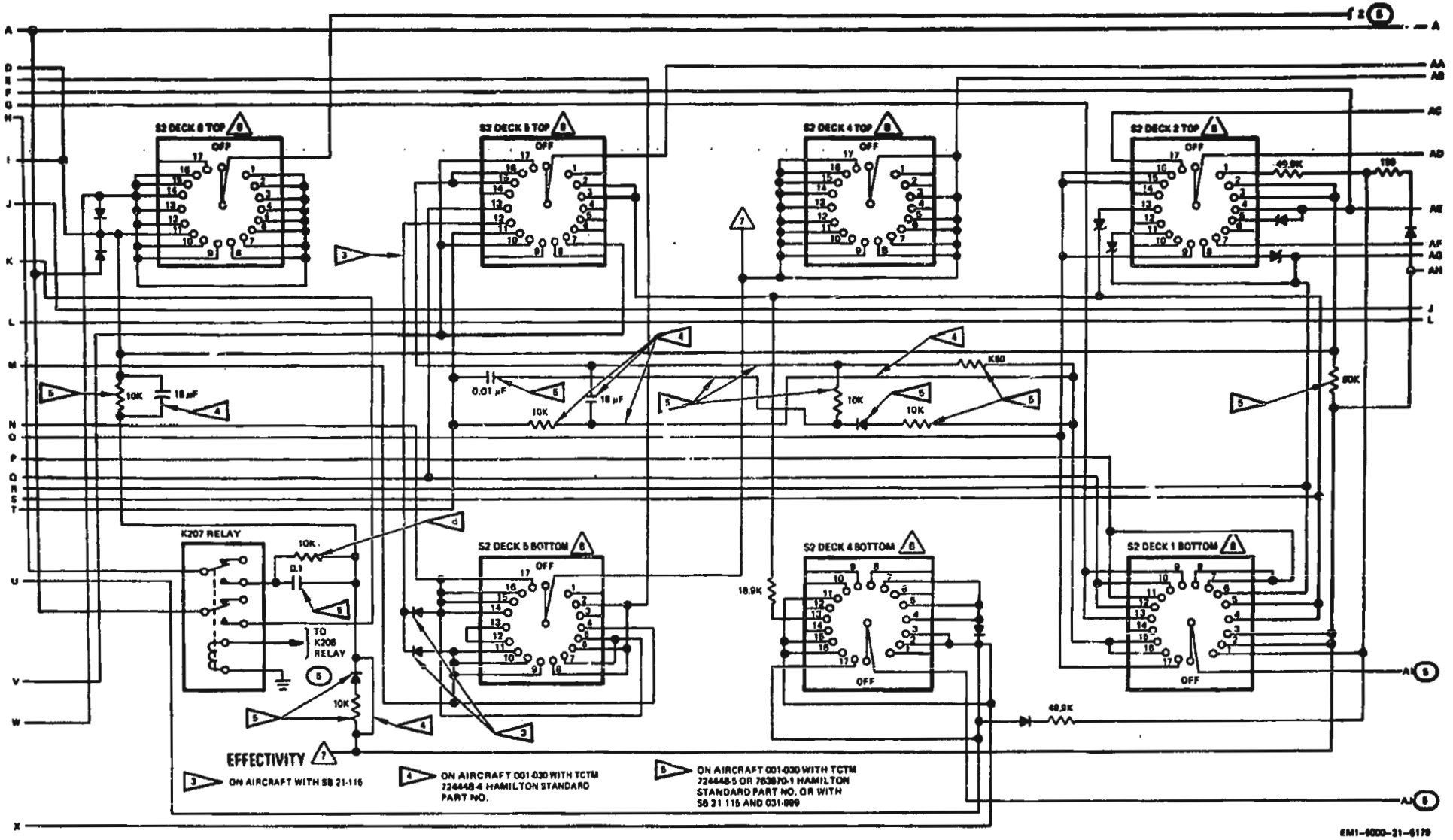
1 ON AIRCRAFT WITHOUT 5821 115

2 ON AIRCRAFT WITH 5821 115


TEMPERATURE CONTROL TEST MODULE (TCTM)
2164-P1B J1B
TEST POINTS
TURBINE BYPASS VALVE AUTO ENGAGE
TURBINE BYPASS VALVE POSITION DEMODULATED FEEDBACK SIGNAL
GAIN SHAPER OUTPUT
TURBINE BYPASS VALVE SERVO AMPLIFIER INPUT
ANTI-ICE CONTROL OUTPUT
2164-P1B J1B
RAM AIR EXHAUST ACTUATOR DEMODULATED FEEDBACK SIGNAL
2164-P1A J1A
RAM AIR ACTUATOR SERVO AMPLIFIER INPUT SIGNAL
RAM AIR EXHAUST ACTUATOR FEEDBACK
ΔP SIGNAL FROM ICE SENSOR
OUTPUT FROM PACK DISCHARGE TEM SENSOR
TURBINE BYPASS VALVE POSITION FEEDBACK SIGNAL
RAM GROUND CLAMP INHIBIT
2164-P1D J1D
FLOW CONTROL VALVE NORMAL FLOW ENGAGE
S1 DECK 1 TOP
S1 DECK 3 TOP
S1 DECK 5 TOP
S1 DECK 7 TOP
S1 DECK 1 BOTTOM
S1 DECK 3 BOTTOM
S1 DECK 5 BOTTOM
S1 DECK 7 BOTTOM
S1 DECK 6 TOP
S1 DECK 4 TOP
S1 DECK 8 TOP
S1 DECK 2 TOP
S1 DECK 2 BOTTOM
S1 DECK 4 BOTTOM
S1 DECK 6 BOTTOM
OFF
EM1-0000-21-6175

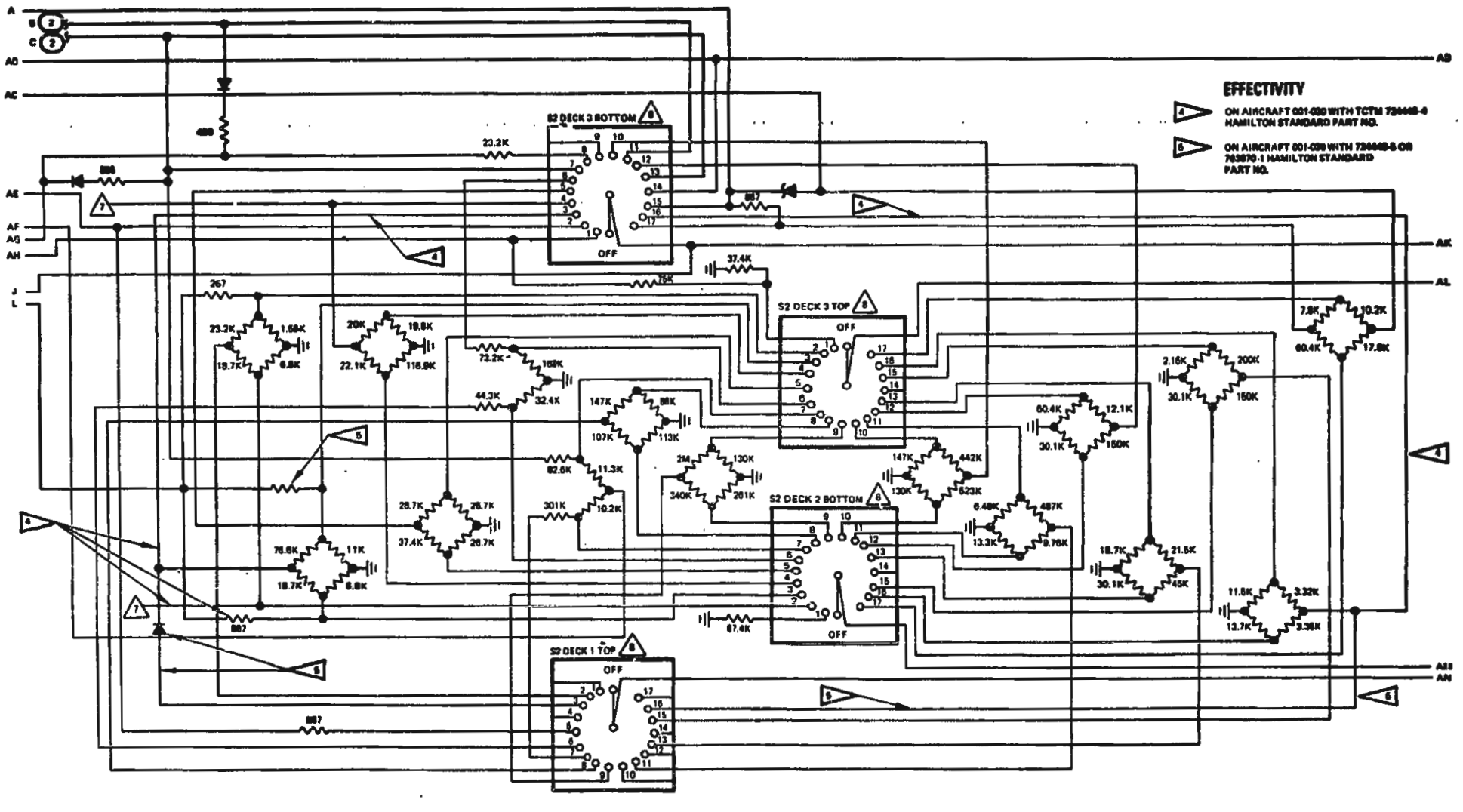
Pack Control Test Modes Schematic
SCHEM 4 (Sheet 2)

EFFECTIVITY: ALL



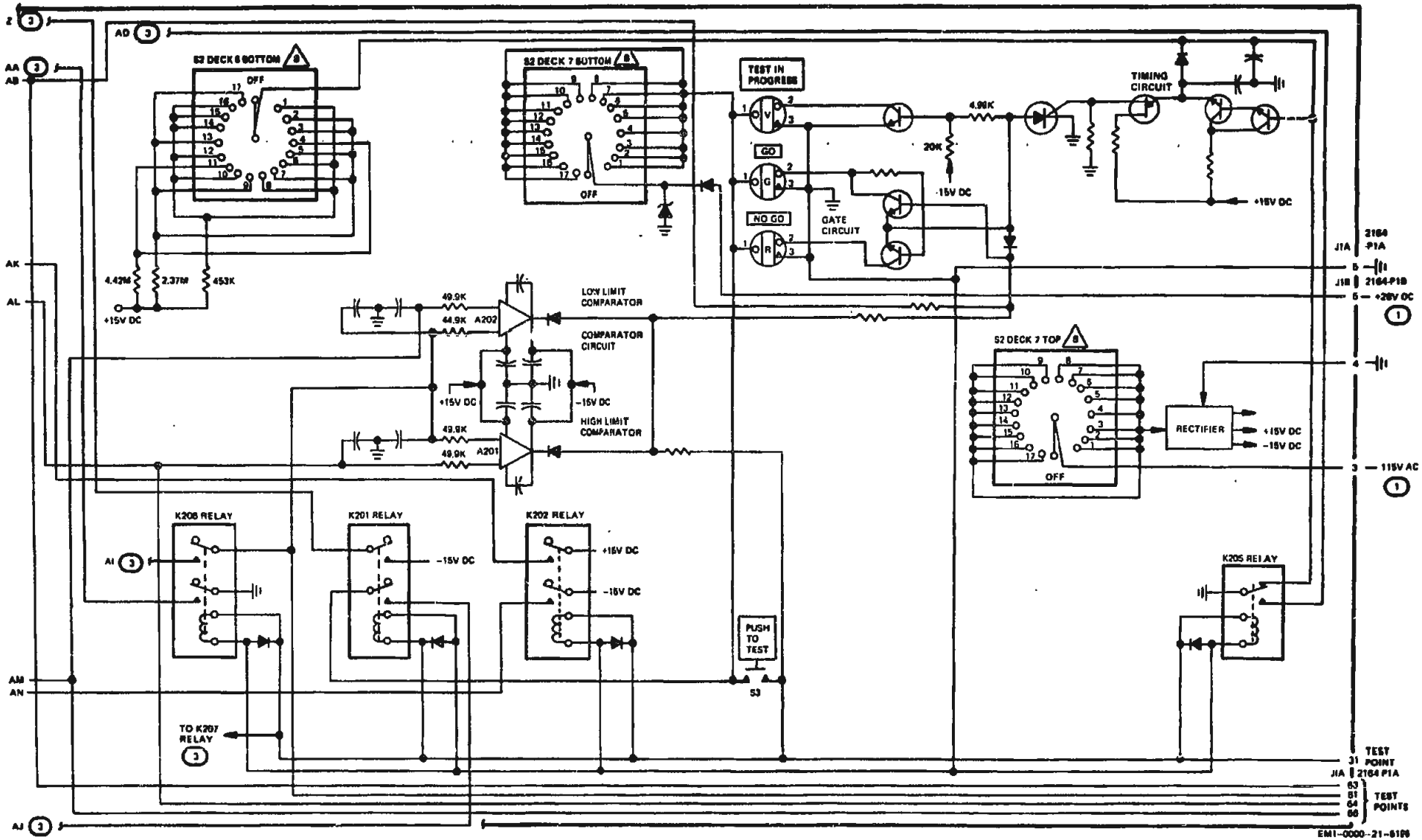
Pack Control Test Modes Schematic
SCHEM 4 (Sheet 3)

R EFFECTIVITY: ALL
R
001B



Pack Control Test Modes Schematic
SCHEM 4 (Sheet 4)

R EFFECTIVITY: ALL
R
001B



Pack Control Test Modes Schematic
SCHEM 4 (Sheet 5)

R
R
001B

EFFECTIVITY: ALL

HUMIDITY CONTROL - ADJUSTMENT AND TEST

1. General

This procedure outlines a check-out to ensure the proper calibration of the humidity control function.

2. Equipment and Materials

A three-place digital voltmeter with a minimum impedance of 10 megohms

Ice bath

Ohmmeter Simpson 260 or equivalent

3. Referenced Procedures

21-62-22	Pack Discharge Temperature Sensor - Removal and Installation
21-64-01	Temperature Control Test Module - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices

4. Adjustment/Test

A. Check out of Low Limit Temperature Clamp

(1) Remove HUMIDITY CONTROL panel from FE/SO lower instrument panel.

(2) Depress humidity control switchlight and apply 28 volts dc to pin 15 and ground pin 10 of humidity panel receptacle.

R (a) Check for 2400 to 2600 ohms on humidity panel, pins 1 and 2, 4 and 5, 7 and 8. If they do not check out, adjust the appropriate trim pots. This is a gross calibration.

(3) Reinstall plug on humidity panel. Do not reinstall humidity panel in lower instrument panel.

(4) Turn on electrical power, (Ref. 24-00-00).

R (5) On aircraft 001-023,
R removeelectrical connectors from pack flow control valve, located beneath the MESC floor (access panels 137AB, 137BB and 137CB for Pack 1, 2, and 3 respectively) and jumper pins 4 and 5 of plug.

R (5) On aircraft 024-999,
R remove electrical connectors from pack flow control
R valve, located beneath the MESC floor (access panels
R 137FB, 137BB and 137CB for pack 1, 2, and 3
R respectively) and jumper pins 4 and 5 of plug.

(6) Depress humidity control switchlight.

(7) Establish a reference signal as follows:

(a) Remove temperature control test module (TCTM) from its rack (Ref. 21-64-01).

(b) Remove pack discharge sensor (Ref. 21-62-22) from pack discharge duct. Insert sensor to 3/4 of probe length into ice bath. Use crushed ice with a small amount of water and stir. Record TCTM plug voltage as follows: (Note pin A3 is signal ground).

PACK	PLUG
1	2164-P2A pin 34
2	2164-P1A pin 43
3	2164-P1A pin 52

Correct the measured voltage by subtracting 0.1 from it.

(c) Remove jumper and replace the pack flow control valve connector. Replace the pack discharge sensor.

(8) Adjusting Low Limit Control Signal Pack 1.

(a) Turn on ECS Pack No. 1 auto using at least 20 psig air source with 150 lb./min. flow capacity.

(b) Slowly adjust the respective low limit clamp trim pot in 1/4 turn increments allowing time for stabilizing, until TCTM pin A34 voltage matches the initial voltage reading of Step 7(b).

(c) Make final adjustment of 2.5 counterclockwise turns. This will place unit control at 35.1 to 39.3 degrees F. Confirm reading of approximately +2.0°C on ECS monitor panel by selecting ACM DISCH.

(9) Repeat Step 7(b) for Pack No. 2 and check Pin A43.

(10) Repeat Step 7(b) for Pack No. 3 and check Pin A52.

(11) Upon completion of check, replace TCTM, remove source of air and turn off electrical power.

PACK TEMPERATURE CONTROLLER - REMOVAL AND INSTALLATION

1. General

The pack control system has three pack temperature controllers (Ref. Fig. 401). The removal and installation procedure for each controller is identical except that different circuit breakers are affected. The title of each circuit breaker corresponds to the controller being removed and installed. The controllers are located in the forward electronics service center, zone 113, on the right-hand electrical rack. Access is through compartment door 112AB.

2. Removal/Installation

A. Removal

(1) On the Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breaker:

R PACK 1 - AUTO/MAN - DC (V5),

R PACK 1 - AUTO/MAN - AC (V6),

R PACK 2 - AUTO/MAN - DC (V7),

R PACK 2 - AUTO/MAN - AC (V8),

R PACK 3 - AUTO/MAN - DC (V17),

R PACK 3 - AUTO/MAN - AC (V18).

(2) Open compartment door 112AB.

(3) Disengage holddown extraction and slide controller out of rack.

B. Installation

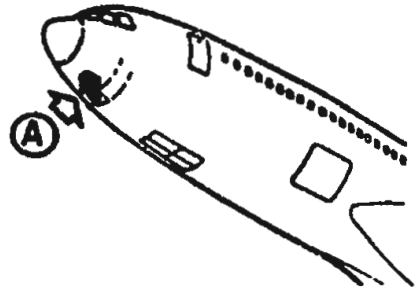
(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

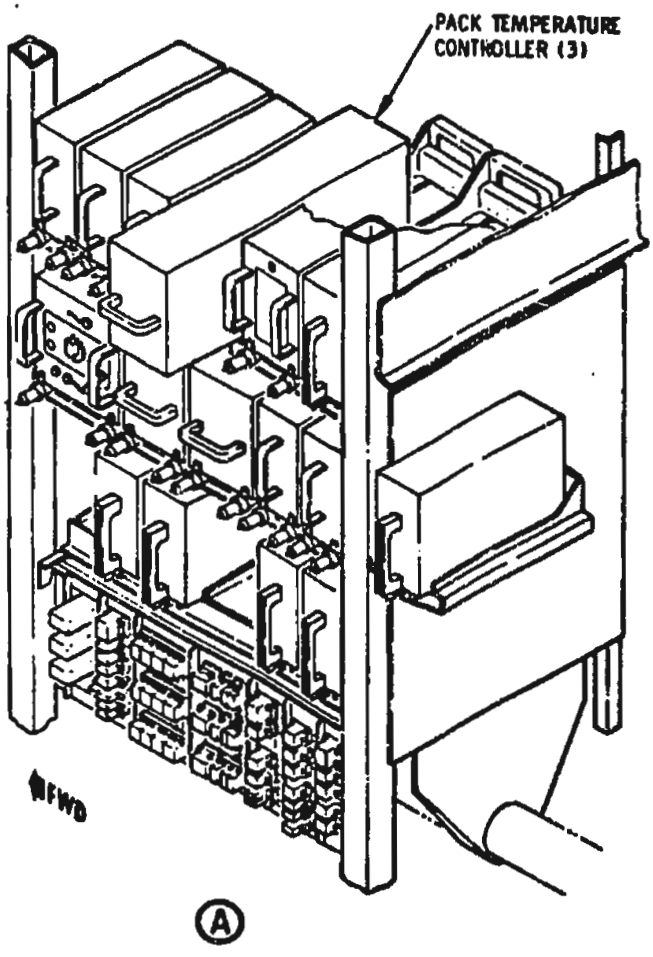
(2) Slide controller into rack and press inward to engage electrical connector.

(3) Connect and tighten holddown extractors.

(4) Close and secure compartment door.

(5) Remove tag and close circuit breaker opened in Step 2A(1).





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Pack Temperature Controller - Removal and Installation
Figure 401

PACK TEMPERATURE CONTROLLER - ADJUSTMENT AND TEST

1. Adjustment/Test

The pack temperature controller is not adjusted on the aircraft. The controller can be functionally tested with the temperature
R control system test module, (Ref. 21-60-00, Temperature Control
R - Adjustment and Test).

RAM AIR EXHAUST VALVE ACTUATOR - MAINTENANCE PRACTICES

1. General

Each of the three ram air exhaust valve actuators is mounted on that exhaust valve frame and access to the actuator is through the small access panel at the forward corner of the valve frame.

2. Maintenance Practices - Deactivation

A. Preparation (All)

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag the applicable following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5) and AC (V6)

PACK 2 - AUTO/MAN - DC (V7) and AC (V8)

PACK 3 - AUTO/MAN - DC (V17) and AC (V18)

(2) Open access panel 115AL-1 (pack 1), 116AR-1 (pack 2), or 116BR-1 (pack 3), as applicable.

(3) Disconnect electrical connectors from actuator(s) and stow for flight.

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT WHEN PERFORMING DEACTIVATION STEPS OUTLINED IN PARAGRAPHS B AND C.

B. One Actuator Inoperative

(1) Insert a 3/16-inch hex wrench in the manual adjustment socket on the actuator body.

CR CR (2) Depress manual brake release button (Ref. 21-62-04, Fig. 401).

CR CR NOTE: It requires 10-20 pounds of force to depress release button.

(3) Rotate wrench clockwise and retract actuator rod until exhaust louvers are fully closed.

(4) Rotate wrench counterclockwise and extend actuator rod 0.4-inch from the fully retracted position.

NOTE: Step (4) will permit operation of the associated pack in flight, and will alleviate the possibility of duct rumble at cruise airspeeds.

(5) Close access panel opened in Step 2A(2).

(6) Remove tags and close circuit breakers opened in Step 2A(1).

(7) On FE/SO cabin temp control panel, zone 215, placard applicable pack control AUTO-MNL switchlight ram air exhaust valve inoperative. Operate affected pack only in flight.

(8) Make appropriate entry in airplane log book.

C. Two Actuators Inoperative

(1) On one of the two inoperative actuators, perform the "one actuator inoperative" procedure, Steps 2B(1) through 2B(5).

(2) On the remaining inoperative actuator, insert a 3/16-inch hex wrench in the manual adjustment socket on the actuator body.

(3) Depress actuator clutch release button.

(4) Rotate the wrench clockwise or counterclockwise, as required, to adjust the exhaust louvers to mid position (actuator rod extended 1.5 inches from fully retracted position).

(5) Close access panels opened in Step 2A(2).

(6) Remove tags and close circuit breakers opened in Step 2A(1).

(7) On FE/SO cabin temp control panel, zone 215, placard applicable pack control AUTO-MNL switchlights ram air exhaust valve inoperative. Operate affected pack only in flight.

(8) Make appropriate entry in airplane log book.

RAM AIR EXHAUST VALVE ACTUATOR - REMOVAL AND INSTALLATION

1. General

The air cycle pack temperature control system includes three identical ram air exhaust valve actuators. Removal and installation procedures are the same for all actuators except for circuit breakers and access panels affected.

One actuator is mounted near the forward end of each ram air exhaust valve frame in zone 115 (No. 1) and zone 116 (No. 2 and No. 3). Access to No. 1 actuator is through access panel 115AL-1, to No. 2 through access panel 116AR-1, and to No. 3 through access panel 116BR-1.

2. Equipment and Materials

Protective caps

R Feeler gage - 0.075 to 0.105 inch

3. Referenced Procedures

21-62-13 Ram Air Exhaust Valve - Adjustment and Test

21-62-13 Ram Air Exhaust Valve - Inspection and Check

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel, CB3, zone 215, open and tag the applicable following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5),

PACK 1 - AUTO/MAN - AC (V6),

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8),

PACK 3 - AUTO/MAN - DC (V17),

PACK 3 - AUTO/MAN - AC (V18).

(2) Open access panel 115AL-1, 116AR-1, or 116BR-1, as applicable.

(3) Disconnect electrical connectors from actuator and install protective caps on actuator and cable connectors. Stow electrical cable to prevent damage.

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

(4) At forward end of ram air exhaust valve remove nut, bolt, and washer connecting actuator rod end to valve torque tube bellcrank (Ref. Fig. 401). Leave busings (2) in bolt holes in bellcrank and retain other parts for installation.

(5) At aft end of actuator, note and record which side of clevis bolt fork (thick or thin) is against exhaust valve frame attachment point shoulder.

CAUTION: NEVER ADD OR DELETE CLEVIS BOLT SHANK WASHERS.

(6) Remove nut, eight plain washers and one countersunk washer from clevis bolt attaching actuator to support structure. Retain all parts for installation.

(7) At aft end (body) of actuator remove nut, bolt, and washer connecting clevis bolt fork to actuator. Leave bushing in bolthole in clevis and retain other parts for installation.

B. Installation

(1) Verify circuit breakers listed in Step 4A(1) are open and tagged.

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

(2) Actuator may be installed only when in the fully electrically driven closed position. Measure actuator to verify eye-to-eye actuator length is 13.00 ±0.021 inches. Reject actuator if length is not correct.

(3) Check required position of clevis bolt, as recorded in Step 4A(5). Verify bushing is in position in bolthole and install clevis bolt on aft end (body) of actuator using bolt, washer, and nut retained from removal (Ref. Fig. 401).

(4) Verify bushings (2) are in bellcrank boltholes. Install actuator rod end on bellcrank with bolt, washer and nut.

R (5) Place countersunk washer on clevis bolt shank (with chamfer toward actuator body) then add three plain washers (two 0.060 inch thick and one 0.030 inch thick) next to countersunk washer.

R (6) Position actuator clevis bolt in actuator support structure mounting hole.

R (7) Remove all slack from exhaust valve linkage by holding the louvers closed and pulling on the actuator with 10-20 lbs of force.

R (8) While maintaining 10-20 lb pull force on actuator, remove or install plain washers (0.030 and 0.060 inch thick) as required from the actuator side of the clevis bolt to obtain a gap of 0.075/0.105 inch between the countersunk washer and plain washers.

R NOTE: Ensure the countersunk washer is against the actuator shoulder with the chamfer side of washer toward actuator.

R (9) Install remaining plain washers on nut side of clevis bolt. Install nut and tighten to remove washer gap and to secure the aft end of actuator to support.

R NOTE: As nut is tightened, washer gap of 0.075/0.105 inch will disappear.

Plain washer total from both sides of clevis bolt must equal eight (two 0.030 inch thick and six 0.060 inch thick washers).

R CAUTION: DO NOT USE FORCE TO CLOSE EXHAUST VALVE.

R (10) Verify free movement of exhaust valve bellcrank, torque tube, linkage and louvers by manually actuating valve open and closed. Inspect valve (Ref. 21-62-13) if excessive friction or binding is apparent or if valve will not fully close.

R (11) Remove protective caps and connect electrical connectors to actuator.

R (12) Remove tags and close circuit breakers opened in Step 4A(1).

R (13) Test actuator and valve (Ref. 21-62-13).

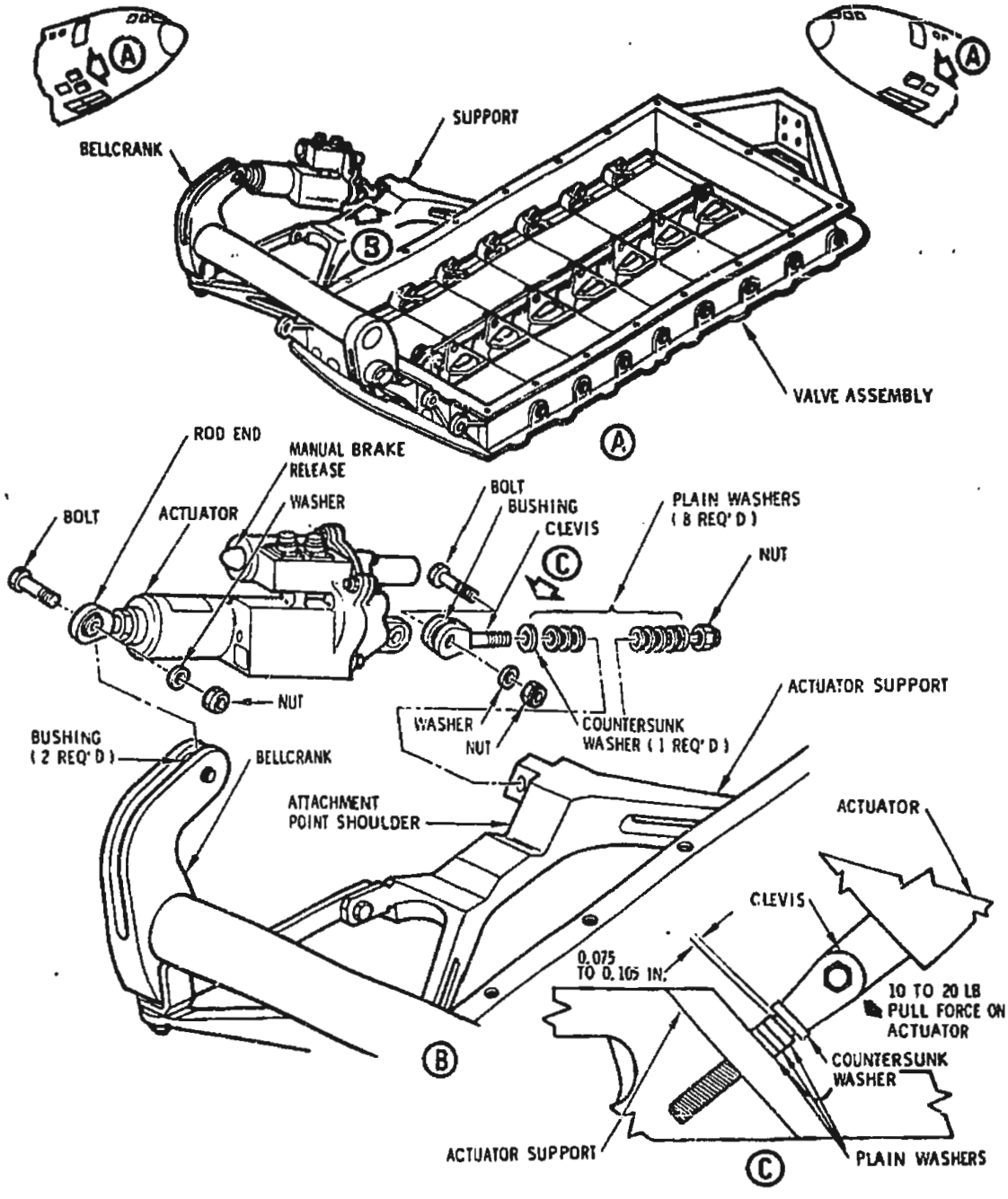
R (14) Verify rigging as follows:

R (a) Drive actuator to full extended position (This may
R be accomplished from F/E panel using manual mode
R of temperature control).

R (b) Extended limit switch must have been activated
R (Panel gage will show turbine bypass valve
R closed).

R (c) No part of lower control system should have
R bottomed out, except the actuator.

R (15) Close access panel opened in Step 4A(2).



M1-0000-21-2532

CR Ram Air Exhaust Valve Actuator - Removal and Installation
CR Figure 401

EFFECTIVITY: ALL

001B

R # RAM AIR EXHAUST VALVE ACTUATOR - ADJUSTMENT AND TEST

R 1. Referenced Procedures

R 21-62-04 Ram Air Exhaust Valve Actuator - Removal and
R Installation

R 21-62-13 Ram Air Exhaust Valve - Adjustment and Test

R 2. Adjustment/Test

R A. Adjustment

R CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

R No adjustment of the ram air exhaust valve actuator may be
R made except for the actuator position adjustment made during
R actuator installation. If ram air exhaust valve operation
R indicates need for actuator adjustment, refer to actuator
R removal and installation procedure (Ref. 21-62-04).

R B. Test

R The ram air exhaust valve actuator may be tested only when
R installed on the ram air exhaust valve. If ram air exhaust
R valve operation indicates need for actuator test, refer to
R ram air exhaust valve adjustment and test procedure (Ref.
R 21-62-13).

RAM AIR EXHAUST VALVE - MAINTENANCE PRACTICES

1. General

R Deactivation for an inoperative ram air exhaust valve is
R accomplished by deactivation of that ram air exhaust valve
R actuator.

2. Referenced Procedure

21-62-04 Ram Air Exhaust Valve Actuator - Maintenance Practices

3. Maintenance Practices

A. Deactivation

(1) Deactivate applicable ram air exhaust valve actuator(s) (Ref. 21-62-04).

(2) Make appropriate entry in aircraft log book.

RAM AIR EXHAUST VALVE - REMOVAL AND INSTALLATION

1. General

The air cycle pack ram air exhaust valve and dual heat exchanger must be removed and installed as an assembly.

2. Referenced Procedure

21-51-01 Dual Heat Exchanger - Removal and Installation

3. Removal/Installation

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

The ram air exhaust valve is removed and installed by following the procedure for removal and installation of the dual heat exchanger (Ref. 21-51-01). After removal of the assembly the ram air exhaust valve is detached from the dual heat exchanger, and the valve and heat exchanger must be joined before installation of the assembly.

RAM AIR EXHAUST VALVE - ADJUSTMENT AND TEST

1. Equipment and Materials

Intercommunication Equipment - Ground to Flight Station

2. Referenced Procedures

21-00-00	Air Conditioning System - Maintenance Practices
21-62-04	Ram Air Exhaust Valve Actuator - Removal and Installation
24-00-00	Electrical Power - Maintenance Practices
36-00-00	Pneumatic System - Maintenance Practices

3. Adjustment/Test

A. Adjustment

CAUTION: DO NOT CHANGE ACTUATOR ROD END ADJUSTMENT.

No adjustment of the ram air exhaust valve may be made after valve installation except for the ram air exhaust valve actuator position adjustment made during actuator installation. If ram air exhaust valve operation indicates need for actuator adjustment, refer to actuator removal and installation procedure (Ref. 21-62-04).

B. Operational Test

R NOTE: If valve performance is not satisfactory (cold cabin
R and/or inability to obtain warm/hot air from any given
R pack) check ram air exhaust valve actuator installation
R (Ref. 21-62-04) washer preload.

The following test verifies acceptable operation of both the ram air exhaust valve and the actuator, using manual control circuits. If check of automatic control circuits is desired, perform system operational check (Ref. 21-00-00) after completing this test.

WARNING: TAG RAM AIR EXHAUST VALVE TO KEEP PERSONNEL CLEAR OF VALVE DURING TEST.

CAUTION: DO NOT PERFORM THIS TEST WHEN PACK IS IN OPERATION. REMOVE PNEUMATIC PRESSURE FROM SYSTEM (REF. 36-00-00) OR CLOSE APPLICABLE PACK FLOW CONTROL VALVE AND TAG CONTROL PANEL TO PREVENT PACK OPERATION UNTIL THIS TEST IS COMPLETED (REF. 21-00-00).

(1) On Flight Engineer/Second Officers aft circuit breaker panel, zone 215, verify circuit breakers for the valve under test are closed:

PACK 1 - AUTO/MAN - DC (V5),

PACK 1 - AUTO/MAN - AC (V6),

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8),

PACK 3 - AUTO/MAN - DC (V17),

PACK 3 - AUTO/MAN - AC (V18).

(2) Turn on electrical power (Ref. 24-00-00).

(3) Station observer, with intercommunication equipment, near ram air exhaust valve to monitor valve operation.

(4) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, place AUTO/MAN switchlight for pack under test in the released (out) position. AUTO legend in switchlight must go off and MNL legend come on.

(5) Verify RAM AIR exhaust valve position indicator indicates observed position of exhaust valve.

NOTE: If normal automatic temperature control of air cycle pack was in operation when pack was shut down, exhaust valve will be full open and indicator will indicate maximum COOLER.

(6) Below RAM AIR indicator, press and hold WARM pushbutton switch. After TURB BYP indicator has reached full clockwise position, ram air exhaust valve must move from full open to full closed within 22 seconds. Release pushbutton.

R CAUTION: NO PART OF THE LOUVER CONTROL SYSTEM SHOULD HAVE
R BOTTOMED OUT, EXCEPT THE ACTUATOR.

(7) Verify exhaust valve operated without visual or audible signs of binding or rough operation and is fully closed, with slight louver preloading.

(8) Verify RAM AIR position indicator moved smoothly from maximum COOLER indication to minimum (180 degrees).

(9) Press and hold COOL pushbutton switch. Ram air exhaust valve must move from full closed to full open within 22 seconds before TURB BYP indicator begins to move. Release pushbutton.

(10) Verify exhaust valve operated without visual or audible signs of binding or rough operation and is fully open without any valve louver or linkage component bottoming out before actuator stopped.

(11) Manually verify that minimal movement of valve louvers and linkage is possible, to be certain open limit switch stopped actuator.

(12) Verify RAM AIR position indicator moved smoothly from minimum to maximum COOLER indication (180 degrees).

(13) If Step 3B(6) was performed starting with ram air exhaust valve at any position other than full open, repeat Steps 3B(6), 3B(7), 3B(8), and 3B(9).

(14) Place AUTO/MAN switchlight in the depressed (latched in) position. MNL legend in switchlight must go off and AUTO legend come on.

(15) Turn off electrical power (Ref. 24-00-00).

(16) Remove warning tag from ram air exhaust valve.

RAM AIR EXHAUST VALVE - INSPECTION AND CHECK

1. General

A check of the most likely to fail parts of the ram air exhaust valve can be accomplished without removal of panels. Complete check of the valve requires removal of panels 115AL for pack No. 1, 116AR for pack No. 2, or 116BR for pack No. 3.

2. Inspection/Check

A. Check

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following circuit breakers:

R PACK 1 - AUTO/MAN - DC (V5),

R PACK 1 - AUTO/MAN - AC (V6),

R PACK 2 - AUTO/MAN - DC (V7),

R PACK 2 - AUTO/MAN - AC (V8),

R PACK 3 - AUTO/MAN - DC (V17),

R PACK 3 - AUTO/MAN - AC (V18).

(2) Check valve louvers visually for cracks or physical damage.

(3) Manually shake each louver to check for looseness of pivot points and connection to actuation bar.

(4) Remove appropriate access panel(s) around valve.

(5) Check valve frame, linkage, and actuator mounts for cracks, distortion and security of mounting.

(6) Reinstall access panel(s).

(7) Remove tags and close circuit breakers opened in Step 2A(1).

TURBINE BYPASS VALVE - MAINTENANCE PRACTICES

1. General

Two turbine bypass valves may be inoperative provided the
R following requirements are met:

The inoperative valve must be locked in the open position.

All other components in the affected air cycle system must be operative.

The associated ram air exhaust actuator and indicator must be operative.

The associated pack flow control valve must be operative and opened only in flight unless required for testing.

The associated ACM discharge temperature must be monitored.

The remaining pack must be fully operative.

NOTE: The following procedures apply ONLY when an aircraft is to be dispatched in accordance with the MEL.

The following deactivation and verification procedures assume electrical power and pneumatic pressure are available.

2. Equipment and Materials

Protective gloves - heat resistant

Protective caps

3/16 inch allen wrench

3. Procedure Preparation

A. Circuit breakers

R (1) On FE/SO aft circuit breaker panel CB3, open and tag
R following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5)

PACK 1 - AUTO/MAN - AC (V6)

PACK 2 - AUTO/MAN - DC (V7)

PACK 2 - AUTO/MAN - AC (V8)

PACK 3 - AUTO/MAN - DC (V17)

PACK 3 - AUTO/MAN - AC (V18)

B. Flight Engineer/Second Officer Panel

(1) On FE/SO ENGINE BLEED CONTROL panel, unlatch and tag three PACK FLOW CONTROL (PFC) switchlights.

NOTE: Unless otherwise specified, the PFC switchlights should remain unlatched.

(2) On FE/SO CABIN TEMP CONTROL panel, unlatch HOT AIR and ISLN VALVE switchlights for packs No. 2 and No. 3.

4. Deactivation

CR WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURE.

CR CAUTION: RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

CR A. Turbine Bypass Valve (TBV) With External Manual Override Clutch

CR (1) Open environmental control system compartment door 117AL for pack No. 1, or 118CR for pack No. 2 or 3.

CR (2) Remove locking screw from manual override release on side of actuator housing.

CR (3) Use one-half-inch wrench to rotate manual override release approximately one-half turn clockwise.

CR (4) Use one-half-inch wrench to rotate manual override and position indicator lever clockwise to OPEN position.

CR (5) Insert locking screw through hole in position indicator lever and screw into housing. Torque screw 20 to 30 lb. in. Locking screw must bottom on indicator lever.

CR (6) Close compartment door.

CR (7) Locate and remove TBV relay 2162-K4, -K11, -K15 for system 1, 2, or 3, respectively. Stow relay for later installation.

CR (8) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard applicable TURB BYP indicator TURBINE BYPASS VALVE INOPERATIVE (OPEN).

CR (9) Place applicable PACK FLOW CONTROL switchlight in released (out) position and placard "OPEN ONLY IN FLIGHT. CLOSE BEFORE LANDING".

CR (10) Make appropriate entry in aircraft logbook.

CR B. Turbine Bypass Valve (TBV) Without External Manual Override Clutch

CR (1) Open environmental control system compartment door 117AL for pack No. 1, or 118CR for pack No. 2 or 3.

CR (2) Insert 3/16-inch allen wrench into base of actuator and turn until valve is full open (approximately 8-10 turns). Check position indicator on top of actuator.

CR (3) Close compartment door.

CR (4) Locate and remove TBV relay 2162-K-4, -K11, -K15 for system 1, 2, or 3, respectively. Stow relay for later installation.

CR (5) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, placard applicable TURB BYP indicator TURBINE BYPASS VALVE INOPERATIVE (OPEN).

CR (6) Place applicable PACK FLOW CONTROL switchlight in released (out) position and placard "OPEN ONLY IN FLIGHT. CLOSE BEFORE LANDING".

CR (7) Make appropriate entry in aircraft logbook.

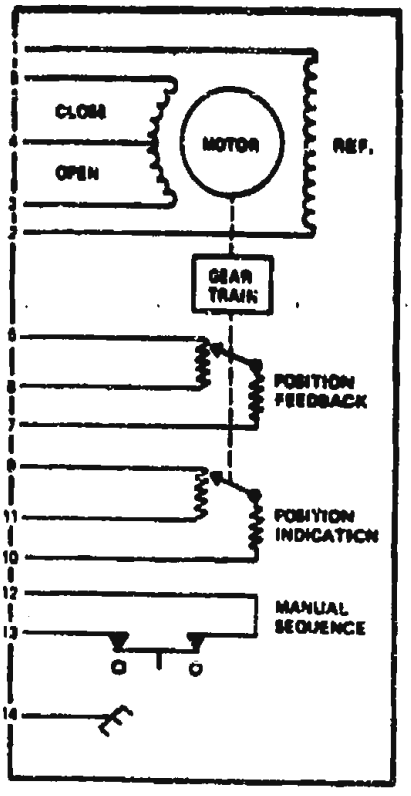
5. Primary Remaining Components and System Operational Test

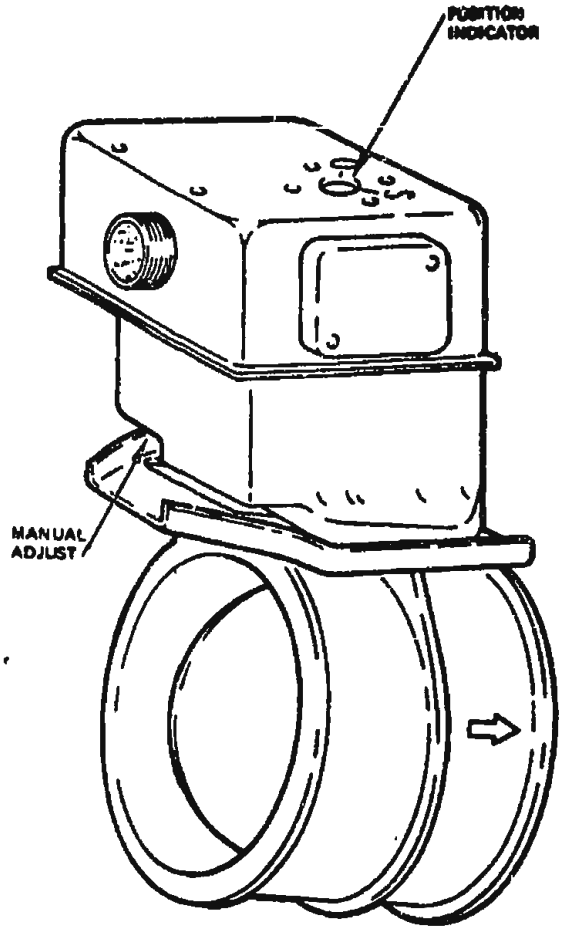
A. Prerequisites

(1) On FE/SO aft circuit breaker panel CB3, remove tags and close following circuit breakers:

PACK 1 - AUTO/MAN - DC (V5)

PACK 1 - AUTO/MAN - AC (V6)





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Turbine Bypass Valve - Deactivation
Figure 201

PACK 2 - AUTO/MAN - DC (V7)

PACK 2 - AUTO/MAN - AC (V8)

PACK 3 - AUTO/MAN - DC (V17)

PACK 3 - AUTO/MAN - AC (V18)

(2) On FE/SO CABIN TEMP CONTROL panel, unlatch all zone trim valve switchlights, CLOSE legends on.

(3) Turn all zone temperature select knobs to 12 o'clock position.

(4) Unlatch all AUTO/MNL switchlights, MNL legends on.

(5) On FE/SO ENGINE BLEED CONTROL panel, ensure all PACK FLOW CONTROL switchlights are unlatched, FLOW BARs off.

B. Component and System Test

(1) Gain access to FESC and locate TEMP CONT TEST MODULE (TCTM) (Ref. Fig. 202).

(2) Perform TCTM self test in accordance with unit operating instructions (Ref. Fig. 203).

NOTE: If TCTM self test shows TCTM to be inoperative (NO-GO), proceed to Paragraph 6.

(3) Perform system test for each pack (Ref. Fig. 203).

NOTE: All components except for the deactivated turbine bypass valve(s) will indicate GO. The deactivated component will show NO-GO.

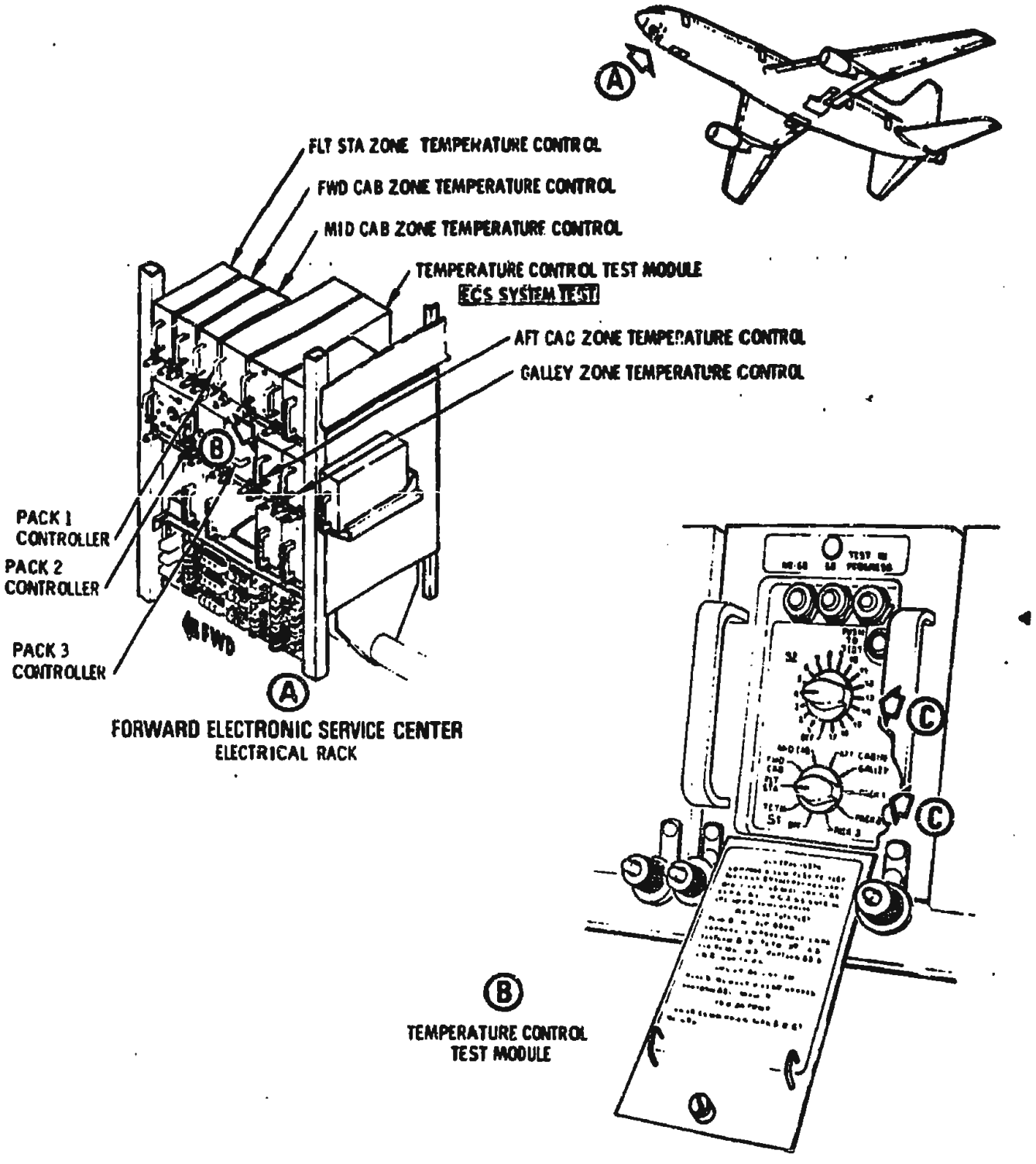
(4) On FE/SO ENGINE BLEED CONTROL panel, placard applicable PACK FLOW CONTROL switchlight OPEN ONLY IN FLIGHT, CLOSE BEFORE LANDING.

(5) On FE/SO CABIN TEMP CONTROL panel, latch in all zone trim valve switchlights, CLOSE legends off.

(6) Latch in all AUTO/MNL switchlights, AUTO legends on.

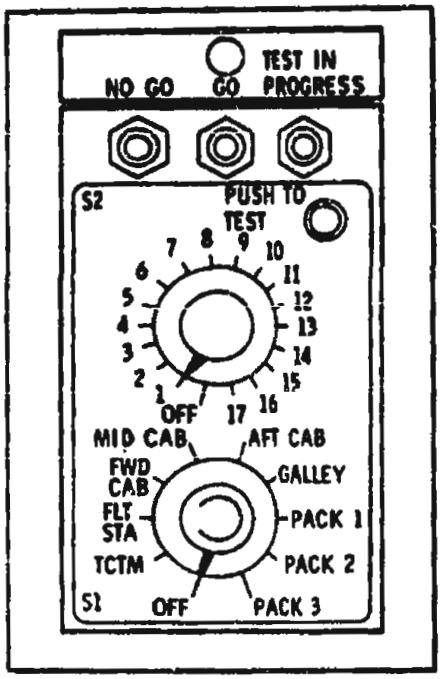
(7) Open and tag circuit breakers closed in Step 5A(1).

(8) Make appropriate entry in aircraft log book.



M1-57200-21-455

Temperature Control Test Module (TCTM) - Location
Figure 202



GENERAL TEST INSTR

Push & hold PUSH TO TEST for GO or NO GO light (4-60 sec). Release button. If NO GO see LRU REPLACEMENT CHART. If GO select next S2 position.

MODULE SELF TEST

Turn S1 to TCTM & S2 to 1. Push indicators to check bulbs. Verify NO GO in S2-1 & 2, and GO in S2-3 & 4.

PACK OR ZONE TEST

Turn S1 to suspect pack on zone. S2 to positions with letters on LRU REPLACEMENT CHART, and perform GENERAL TEST.

IMPORTANT

Turn S1 & S2 OFF after test.

LRU REPLACEMENT CHART

OFF	TCTM	Flt Sta	Fwd Cab	Mid Cab	Aft Cab	Galley	Pack 1	Pack 2	Pack 3
1	A	C	C	C	C	C	L	L	L
2	A	D	D	D	D	D	D	D	D
3	B	D	D	D	D	D	D	D	D
4	B	E	E	E	E	E	-	-	-
5	-	-	-	-	-	-	F	F	F
6	-	G	G	G	G	G	H	H	H
7	-	-	-	-	-	-	D	D	D
8	-	D	D	D	D	D	D	D	D
9	-	I	I	I	I	I	-	-	-
10	-	J	J	J	J	J	-	-	-
11	-	D	D	D	D	D	-	-	-
12	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	D	D	D
16	-	-	-	-	-	-	D	D	D
17	-	-	-	-	-	-	K	K	K

LETTER CODE FOR LRU REPLACEMENT CHART

A - See Module Self Test
B - TCTM
C - If flt sta checklist verified, malf in mnl ckt
D - Controller
E - Zone Trim Valve
F - Turbine Bypass Valve
G - Zone Duct Temp Sensor
H - Pack Discharge Temp Sensor
I - Zone Temp Sensor
J - Temp Selector
K - Ram Air Actuator
L - If flt sta checklist verified, malf in mnl ckt or flow control switch ckt
- - No test

NOTE: A NO-GO ON C AND L CODES INDICATES CIRCUIT FAULTS IF THE FLT STA CHECK LIST HAS BEEN PROPERLY COMPLETED. IF C OR L NO-GO IS OBTAINED, VERIFY THE FLT STA CHECK LIST ITEMS, THEN TROUBLESHOOT THE INDICATED WIRING.

M1-0000-21-2016

TCTM Operating Instruction
Figure 203

6. Secondary Remaining Components and System Operational Test

NOTE: This procedure applies only if TCTM self test shows TCTM NO-GO.

A. Verify Remaining Components of Associated Air Cycle System are Operational

(1) On FE/SO ENGINE BLEED CONTROL panel, set switchlights as follows:

ENG ISLN VALVEs latched in, FLOW BARs on

Aft Fuselage ISLN VALVE latched in, FLOW BAR on

Left and right CROSS BLEEDs latched in, FLOW BARs on

Packs No. 1, 2, and 3 PACK FLOW CONTROL unlatched, FLOW BARs off

(2) On FE/SO CABIN TEMP CONTROL panel, set switchlights as follows:

Packs No. 1, 2, and 3 AUTO/MNL latched in, AUTO legends on

No. 2 and 3 HOT AIR unlatched, FLOW BARs off, OFF legends on

No. 2 and 3 hot air manifold ISLN VALVEs unlatched, FLOW BAR off

(3) On FE/SO aft circuit breaker panel CB3, remove tags and close circuit breakers applicable to system being tested as follows:

Pack No. 1 -	PACK 1 - AUTO/MAN - DC (V5)
	PACK 1 - AUTO/MAN - AC (V6)
Pack No. 2 -	PACK 2 - AUTO/MAN - DC (V7)
	PACK 2 - AUTO/MAN - AC (V8)
Pack No. 3 -	PACK 3 - AUTO/MAN - DC (V17)
	PACK 3 - AUTO/MAN - AC (V18)

CAUTION: DO NOT ALLOW PACK FLOW CONTROL VALVE TO REMAIN OPEN ANY LONGER THAN REQUIRED TO OBTAIN AN INDICATION.

(4) Pack Flow Control Valve Operational Check

NOTE: This procedure also checks flight station control and operation of hot manifold temperature control valves and hot manifold isolation valves for packs No. 2 and 3.

(a) On FE/SO ENGINE BLEED CONTROL panel, latch in PACK FLOW CONTROL switchlight for system being tested, FLOW BAR on.

NOTE: Flow bar reaction is indication of valve function.

(b) For packs No. 2 or No. 3, on FE/SO CABIN TEMP CONTROL panel, latch in applicable HOT AIR and ISLN VALVE switchlights, FLOW BARs on. OFF legend in HOT AIR switchlight off.

(c) On FE/SO ENGINE BLEED CONTROL panel, unlatch PACK FLOW CONTROL switchlight, FLOW BAR off.

NOTE: When No. 2 or No. 3 pack flow control valves are closed the flow bars of the associated HOT AIR and ISLN VALVE switchlights will also go off.

(d) On FE/SO CABIN TEMP CONTROL panel, unlatch No. 2 or No. 3 HOT AIR and ISLN VALVE switchlights, if required. Verify OFF legend of HOT AIR switchlight on.

(e) On FE/SO ENGINE BLEED CONTROL panel, placard associated PACK FLOW CONTROL switchlight OPEN ONLY IN FLIGHT, CLOSE BEFORE LANDING.

(5) On FE/SO ENGINE BLEED CONTROL panel, unlatch switchlights for pack under test as follows:

Pack No. 1	No. 1 ENG ISLN VALVE, FLOW BAR off Left CROSS BLEED, FLOW BAR off
Pack No. 2	No. 2 ENG ISLN VALVE, FLOW BAR off Aft fuselage ISLN VALVE, FLOW BAR off Left and right CROSS BLEED, FLOW BAR off
Pack No. 3	No. 3 ENG ISLN VALVE, FLOW BAR off

Right CROSS BLEED,
FLOW BAR off

(6) In the MESC gain access to associated pack flow control valve by opening floor panels as follows:

On aircraft 001-031

Pack No. 1	Floor panel 137AB
PACK No. 2	Floor panel 137BB
PACK No. 3	Floor panel 137CB

On aircraft 032-999

Pack No. 1	Floor panel 137FB
Pack No. 2	Floor panel 137BB
Pack No. 3	Floor panel 137CB

(7) On FE/SO ENGINE BLEED CONTROL panel, latch in PACK FLOW CONTROL switchlight.

NOTE: The PACK FLOW CONTROL switchlight flow bar will remain off until the pack flow control valve is open.

(8) In MESC, manually open pack flow control valve. Verify flow bar in PACK FLOW CONTROL switchlight comes on.

(9) Verify Pack Temperature Controller, Zone Temperature Controller, and Automatic Function of Ram Air Exhaust Valve Actuator and Indicator.

(a) On FE/SO CABIN TEMP CONTROL panel, verify AUTO/MNL switchlight is latched in, AUTO legend on.

(b) Unlatch GND CONT switchlight, RAM AUTO legend on.

(c) On FE/SO ECS MONITOR panel, latch in TEMP SELECT switchlight, ZONE legend on.

(d) On FE/SO ENGINE BLEED CONTROL panel, observe RAM AIR indicator and verify ram air exhaust valve moves clockwise to approximately 30 percent open (max in flight) position. Visually verify valve is repositioned.

(e) On FE/SO CABIN TEMP CONTROL panel, turn all zone trim temperature selectors to full warm.

(f) Observe RAM AIR indicator, verify pointer moves clockwise toward closed (WARM). Visually verify ram air exhaust valve closes.

(g) Turn all zone trim temperature selectors to full cold.

(h) Observe RAM AIR indicator, verify pointer moves counterclockwise toward open (cooler). Visually verify ram air exhaust valve opens.

(i) Latch in GND CONT switchlight, RAM AUTO legend off.

(j) Observe RAM AIR indicator, verify pointer moves counterclockwise to full open. Visually verify valve is full open.

(10) Verify Manual Operation of Ram Air Exhaust Valve Actuator.

(a) On FE/SO CABIN TEMP CONTROL panel, verify GND CONT switchlight is latched in.

(b) Unlatch AUTO/MNL switchlight, MNL legend on.

(c) Press and hold manual WARM button.

(d) Observe RAM AIR indicator, verify pointer moves clockwise toward closed (WARM). Visually verify ram air exhaust valve moves toward closed. Release manual WARM button.

(e) Press and hold manual COOL button.

(f) Observe RAM AIR indicator, verify pointer moves counterclockwise to full open (cooler). Visually verify ram air exhaust valve moves to full open. Release manual COOL button.

(g) Latch in AUTO/MNL switchlight, AUTO legend on.

(11) Verify Operation of Pack Discharge Temperature Sensors.

(a) On FE/SO ECS MONITOR panel, turn PACK SELECT rotary switch to pack being tested.

(b) Turn system position rotary select switch to CPRSR DISCH.

(c) On ECS temperature indicator, reading should be approximately ambient.

(d) Turn system position rotary select switch to ACM DISCH.

(e) On ECS temperature indicator, reading should be approximately ambient.

NOTE: An open or short in the system will result in either a zero reading or maximum reading.

(12) On FE/SO ENGINE BLEED CONTROL panel unlatch PACK FLOW CONTROL switchlight.

NOTE: Flow bar will remain on until pack flow control valve is closed.

(13) In MESC manually close pack flow control valve. Verify flow bar in PACK FLOW CONTROL switchlight goes off.

(14) Close and secure MESC floor panels opened in Step 6A(6).

(15) Latch in switchlights unlatched in Step 6A(5).

(16) Open and tag circuit breakers closed in Step 6A(3).

(17) Make appropriate entry in aircraft log book.

B. Verify Remaining Pack(s) is Fully Operational

NOTE: Valve operation is determined by flow bar activity.

(1) On FE/SO ENGINE BLEED CONTROL panel, set switchlights as follows:

ENG ISLN VALVEs latched in, FLOW BARs on

Aft fuselage ISLN VALVE latched in, FLOW BAR on

Left and right CROSS BLEEDs latched in, FLOW BARs on

Packs No. 1, 2, and 3 PACK FLOW CONTROL unlatched, FLOW BARs off

(2) On FE/SO CABIN TEMP CONTROL panel, set switchlights as follows:

Packs No. 1, 2, and 3 AUTO/MNL latched in, AUTO legends on

No. 2 and 3 HOT AIR unlatched, OFF legends on, FLOW BARs off.

No. 2 and 3 hot air manifold ISLN VALVEs unlatched, FLOW BARs off

(3) On FE/SO aft circuit breaker panel CB3, remove tags and close circuit breakers applicable to system being tested as follows:

Pack No. 1 -	PACK 1 AUTO/MAN - DC (V5)
R	PACK 1 AUTO/MAN - AC (V6)
Pack No. 2 -	PACK 2 AUTO/MAN - DC (V7)
	PACK 2 AUTO/MAN - AC (V8)
Pack No. 3 -	PACK 3 AUTO/MAN - DC (V17)
	PACK 3 AUTO/MAN - AC (V18)

(4) On FE/SO ECS MONITOR panel, turn PACK SELECT rotary switch to pack being tested.

(5) On FE/SO CABIN TEMP CONTROL panel turn all zone trim temperature selectors to ~2 o'clock position.

(6) On FE/SO ENGINE BLEED CONTROL panel, latch in applicable PACK FLOW CONTROL switchlight. FLOW BAR on.

(7) On FE/SO ECS MONITOR panel, observe PACK FLOW indicator. Indication should range between 1000 and 3500 CFM.

(8) For packs No. 2 or 3

(a) On FE/SO CABIN TEMP CONTROL panel, latch in HOT AIR switchlight, OFF legend off, FLOW BAR on.

(b) Latch in ISLN VALVE, FLOW BAR on.

(9) On FE/SO CABIN TEMP CONTROL panel, unlatch GND CONT switchlight, RAM AUTO legend on.

(10) Observe RAM AIR indicator, verify pointer moves clockwise to approximately 30 percent open (max in flight) position.

(11) Turn all zone trim temperature selectors to full clockwise position.

(12) Observe and verify the following indicator reaction in listed sequence:

TURB BYP indicator pointer moves clockwise to full warm

NOTE: Pointer may already be full warm indicating turbine bypass valve is full open.

RAM AIR indicator pointer moves clockwise

(13) Turn all zone trim temperature selectors to full counterclockwise position.

(14) Observe and verify the following indicator reaction in listed sequence:

RAM AIR indicator pointer moves counterclockwise to 30 percent open (max in flight) position. TURB BYP indicator pointer moves counterclockwise.

(15) Return all zone trim temperature selectors to the 12 o'clock position.

(16) Unlatch AUTO/MNL switchlight, MNL legend on.

(17) Press and hold manual WARM button.

(18) Observe and verify the following indicator reaction in listed sequence:

TURB BYP indicator pointer moves clockwise to full warm

NOTE: Pointer may already be full warm indicating turbine bypass valve is full open.

RAM AIR indicator pointer moves clockwise

(19) Release manual WARM button, verify indicator pointer movement stops.

(20) Press and hold manual COOL button.

(21) Observe and verify the following indicator reaction in listed sequence: RAM AIR indicator pointer moves counterclockwise to 30 percent open (max in flight) position

TURB BYP indicator pointer moves counterclockwise

(22) Release manual COOL button, verify indicator pointer movement stops.

(23) Latch in AUTO/MNL switchlight, AUTO legend on.

(24) Latch in GND CONT switchlight, RAM AUTO legend off.

(25) Observe RAM AIR indicator, verify pointer moves full counterclockwise to full open or on ground position.

(26) Unlatch ISLN VALVE switchlight, FLOW BAR off.

(27) Unlatch HOT AIR switchlight, FLOW BAR off, OFF legend on.

(28) On FE/SO ENGINE BLEED CONTROL panel, unlatch PACK FLOW CONTROL switchlight, FLOW BAR off.

(29) Open and tag circuit breakers closed in Step 6B(3).

(30) Unlatch switchlights latched in, in Step 6B(1), FLOW BARs off.

(31) Make appropriate entry in aircraft log book.

TURBINE BYPASS VALVE - REMOVAL AND INSTALLATION

1. General

The No. 1 air cycle system (pack) turbine bypass valve is in the left environmental control system (ECS) compartment, zone 117, with access through ECS compartment access door 117AL. Turbine bypass valves for No. 2 and No. 3 systems are in the right ECS compartment, zone 118, with access through ECS compartment access door 118CR (Ref. Fig. 401).

Removal and installation procedures for all three valves are the same except for circuit breaker and access references, and those steps noted as peculiar to the No. 3 turbine bypass valve, for improved access.

2. Equipment and Materials

Protective Caps

Heat resistant gloves

R On aircraft 001-014,
R O-rings (2), MS9068-434, or equivalent

R On aircraft 001-014,
R Non-hardening silicone, Lubricant, Viscasil 10000, or equivalent

R 3. Referenced Procedures

R	20-21-01	Flexible Swaged Couplings - Removal and
R		Installation (on aircraft 001-014)
	20-36-01	Single T-Bolt V-Band Coupling - Removal and Installation
	21-00-00	Air Conditioning - Maintenance Practices

4. Removal/Installation

A. Removal

WARNING: FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH PRESSURE GROUND AIR CONNECTIONS MUST BE TAGGED TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breakers:

PACK 1 - AUTO/MAN - DC (V5),

PACK 1 - AUTO/MAN - AC (V6),

PACK 2 - AUTO/MAN - DC (V7),

PACK 2 - AUTO/MAN - AC (V8),

PACK 3 - AUTO/MAN - DC (V17),

PACK 3 - AUTO/MAN - AC (V18).

(2) Open applicable ECS compartment access door, 117AL or 118CR.

WARNING: RECENT OPERATION OF SYSTEM WILL REQUIRE PRECAUTIONS AGAINST HIGH TEMPERATURES, USE PROTECTIVE GLOVES WHEN REQUIRED.

R R (3) For pack No. 3, remove screw, nut and washer attaching adapter to valve bracket (Ref. Fig. 401)

(4) For pack No. 3, remove duct connecting No. 2 air cycle machine (ACM) turbine discharge port to the No. 2 water separator inlet by disconnecting band clamps and seals at each end of duct. Slide band clamps back onto duct for use at installation.

(5) For pack No. 3, disconnect lower end attachment of intervening electrical support bracket, and swing bracket and electrical cables clear of working area (bracket is approximately 18 inches long).

(6) Disconnect electrical cable connector from valve receptacle, install protective caps on connector and receptacle, and stow cable to prevent damage.

R R R R (7) On aircraft 001-014, disconnect flexible swaged coupling from discharge end of valve and discard o-rings (Ref. 20-21-01). Retain all other parts for reinstallation.

R R R R R R R (7) On aircraft 015-999, disconnect two band clamps securing seal over discharge end of valve and duct to ACM and slide clamps and seal off end of valve onto duct, enough to expose flange of valve. (8) Disconnect T-bolt V-band coupling at other end of valve and slide coupling back onto duct.

R (9) On packs 1 and 2 only, remove nut, washer and screw attaching valve mounting bracket to bracket on duct and carefully slide valve from between ducts.

R (10) Slide seal from duct and carefully clean and inspect seal for damage or deterioration. Replace if damaged or deteriorated.

R (11) If replacement valve is not immediately available for installation, install protective caps on open ducts.

B. Installation

(1) Verify that tags previously installed on FE/SO ENGINE BLEED AIR and APU CONTROL panels and the three high-pressure ground air connections are in place.

(2) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(3) Remove protective caps from ducts, thoroughly clean duct flanges, and inspect to verify flanges are undamaged.

R (4) Remove shipping caps from replacement turbine bypass valve, wipe flanges clean, and inspect to verify valve flanges are undamaged.

R (5) Verify single T-bolt V-band coupling is on duct from heat exchanger.

R (6) On aircraft 001-014, lubricate swaged coupling body threads, split washer, o-ring and split retainer and install on duct to ACM (Ref. 20-21-01).

R NOTE: Split washers and split retainer must be sprung slightly to fit over duct ferrule.

R (6) On aircraft 015-999, verify two band clamps are on duct to ACM.

R (7) On aircraft 001-014, lubricate swaged coupling nut threads, split washer and o-ring and install on discharge end of valve (Ref. 20-21-01).

R (7) On aircraft 015-999, carefully slide seal over flange onto duct to ACM.

(8) With FLOW arrow on valve pointing toward ACM, carefully slide valve into position between duct ends and loosely install V-band coupling on valve inlet to duct connection.

R (9) On packs 1 and 2 only,
R rotate valve to mate valve mounting bracket to bracket
R on duct and install screw, washer and nut attaching
R valve mounting bracket to bracket on duct.

R (9) On pack 3 only,
R rotate valve to mate valve mounting bracket to adapter
R on duct (approximately 3 o'clock position) and install
R screw, washer and nut attaching valve mounting bracket
R to adapter on duct.

NOTE: Use of tri-wing recess hex-head bolt in place of tri-wing screw will facilitate installation.

R (10) On aircraft 001-014,
R position swaged coupling retainer over ferrules of both
R duct and valve (Ref. 20-21-01).

R (10) On aircraft 015-999,
R carefully slide seal from duct onto valve until seal is
R centered over duct and valve flanges.

R (11) On aircraft 001-014,
R slide o-rings and washers into position against
R retainer. Verify o-rings are not twisted (Ref.
R 20-21-01).

R (11) On aircraft 015-999,
R position duct for best alignment and move band clamps
R from duct into position on seal, near the shoulders at
R each end of the seal, between the shoulders and duct
R and valve flanges (Ref. Fig. 401).

R (12) On aircraft 001-014,
R slide coupling body over retainer and o-rings.

R (12) On aircraft 015-999,
R verify duct and valve flanges are not under band clamps
R and clamps are properly positioned.

R (13) On aircraft 001-014,
R thread coupling nut onto body, align carefully, tighten
R and lockwire. Refer to 20-21-01 for torque valves.

R (13) On aircraft 015-999,
R torque clamps 50 to 60 lb in.

R (14) Torque single T-bolt V-band coupling at inlet end of valve (Ref. 20-36-01).

R (15) Remove protective caps and connect electrical harness connector to valve receptacle.

R (16) For pack No. 3, install electrical support bracket disconnected in Step 4A(5).

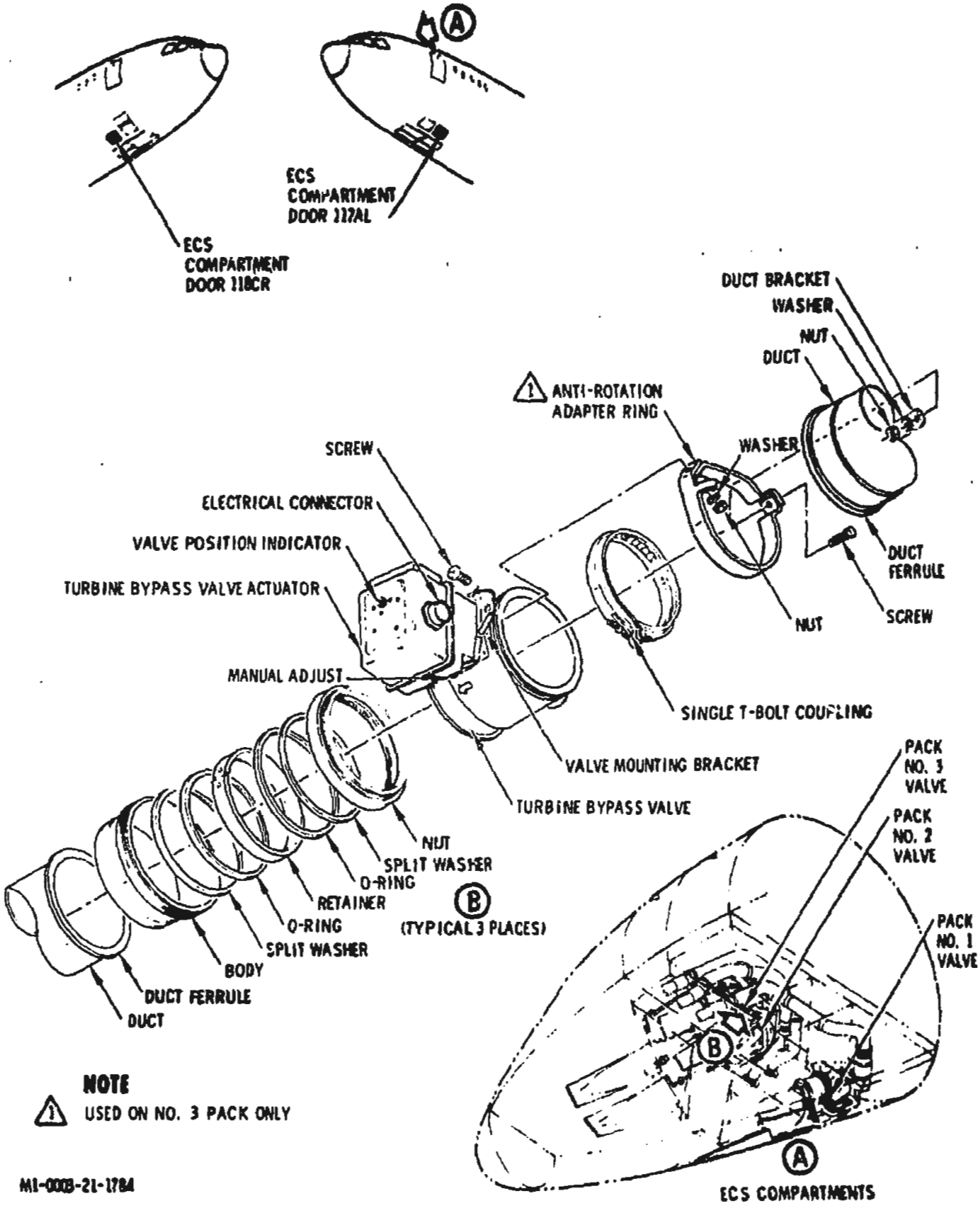
R (17) For pack No. 3, install duct removed in Step 4A(4), using band clamps and seals retained from removal.

R (18) Remove tags and close circuit breakers opened in Step 4A(1).

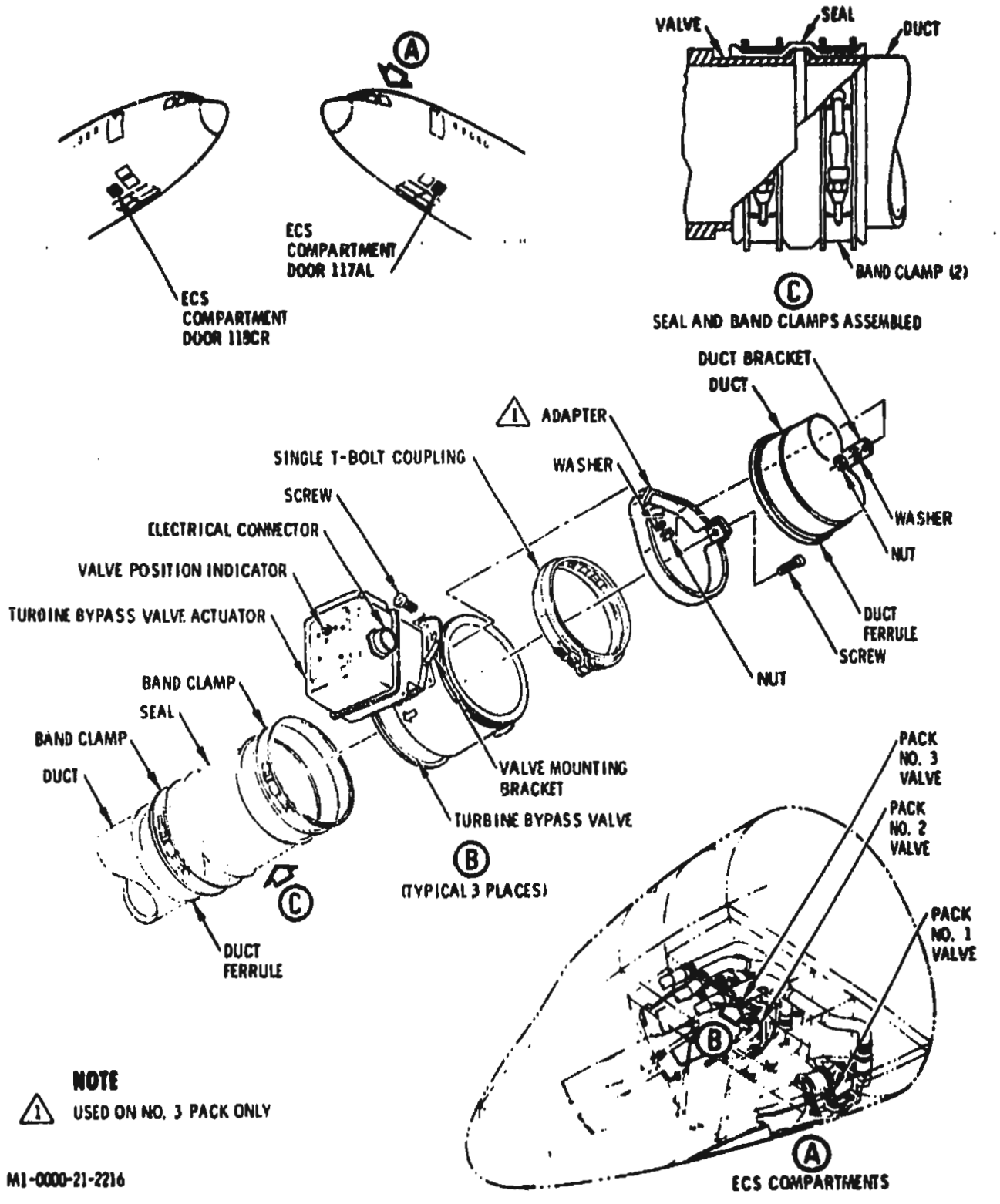
R (19) Remove WARNING tags installed in Paragraph 4A.

R (20) Operate applicable air cycle cooling system(s) (Ref. 21-00-00) and check all disturbed duct and valve joints for leakage and turbine bypass valve for proper operation in automatic and manual temperature control.

R (21) Close ECS compartment access door.



R Turbine Bypass Valve - Removal and Installation
R Figure 401



R Turbine Bypass Valve - Removal and Installation
R Figure 401

R EFFECTIVITY: 015-999
R
0018

TURBINE BYPASS VALVE - ADJUSTMENT AND TEST

1. General

Operation of the turbine bypass valve may be observed on the TURB BYP indicator located on the Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215.

No adjustment of the turbine bypass valve is made on the aircraft.

2. Referenced Procedure

21-00-00	Air Conditioning System - Fault Isolation/Identification
21-60-00	Temperature Control System - Adjustment and Test
24-00-00	Electrical Power - Maintenance Practices

3. Adjustment/Test

R A. Operational Test - Manual Control

CAUTION: IF THIS TEST IS PERFORMED WHEN AIR CYCLE SYSTEM IS OPERATING, CAREFULLY OBSERVE SYSTEM TEMPERATURE AND PRESSURE LIMITATIONS (REF. 21-00-00).

(1) Turn on electrical power (Ref. 24-00-00).

(2) On Flight Engineer/Second Officers CABIN TEMP CONTROL panel, zone 215, place applicable AUTO/MNL switchlight in the released (out) position, MNL legend will come on.

(3) Press and hold associated COOL switch. After RAM AIR indicator has reached the full COOLER position the TURB BYP indicator must run full COOLER. Release COOL switch.

(4) Press and hold associated WARM switch. TURB BYP indicator must move to full-clockwise position before RAM AIR indicator begins to move. Release WARM switch.

(5) Depress AUTO/MNL switchlight to the normal (latched in) position. MNL legend must go off and AUTO legend come on.

R (6) To test automatic temperature control system operation
R of turbine bypass valve, perform Temperature Control
R System BITE test (Ref. 21-60-00) or, if necessary, Air
R Conditioning System Fault Isolation/Identification
R procedure (Ref. 21-00-00).

R (7) Turn off electrical power (Ref. 24-00-00).

PACK ICE SENSOR - REMOVAL AND INSTALLATION

1. General

There are three ice sensors in the air cycle pack system (Ref. Fig. 401). One sensor is mounted on each of the three water separators. One water separator is located in the left environmental control system (ECS) compartment, and two water separators are located in the right ECS compartment. Access is through access doors 117AL and 118CR.

2. Equipment and Materials

Protective caps and plugs

3. Referenced Procedure

21-00-00 Air Conditioning - Maintenance Practices

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag the following applicable circuit breaker:

R PACK 1 - AUTO/MAN - DC (V5),

R PACK 1 - AUTO/MAN - AC (V6),

R PACK 2 - AUTO/MAN - DC (V7),

R PACK 2 - AUTO/MAN - AC (V8),

R PACK 3 - AUTO/MAN - DC (V17),

R PACK 3 - AUTO/MAN - AC (V18).

(2) Open access door 117AL or 118CR, as applicable.

(3) Disconnect electrical cable connector from sensor receptacle and install protective caps.

(4) Remove screws from sensor mounting boss.

(5) Remove sensor from water separator mounting pad and install protective plugs in inlet and outlet pressure ports of sensor and water separator.

B. Installation

(1) Verify that circuit breakers opened in Step 4A(1) are open and tagged.

(2) Remove shipping plate from sensor mounting boss, and check that O-rings are installed in inlet and outlet pressure ports.

(3) Remove protective plugs from water separator inlet and outlet pressure ports.

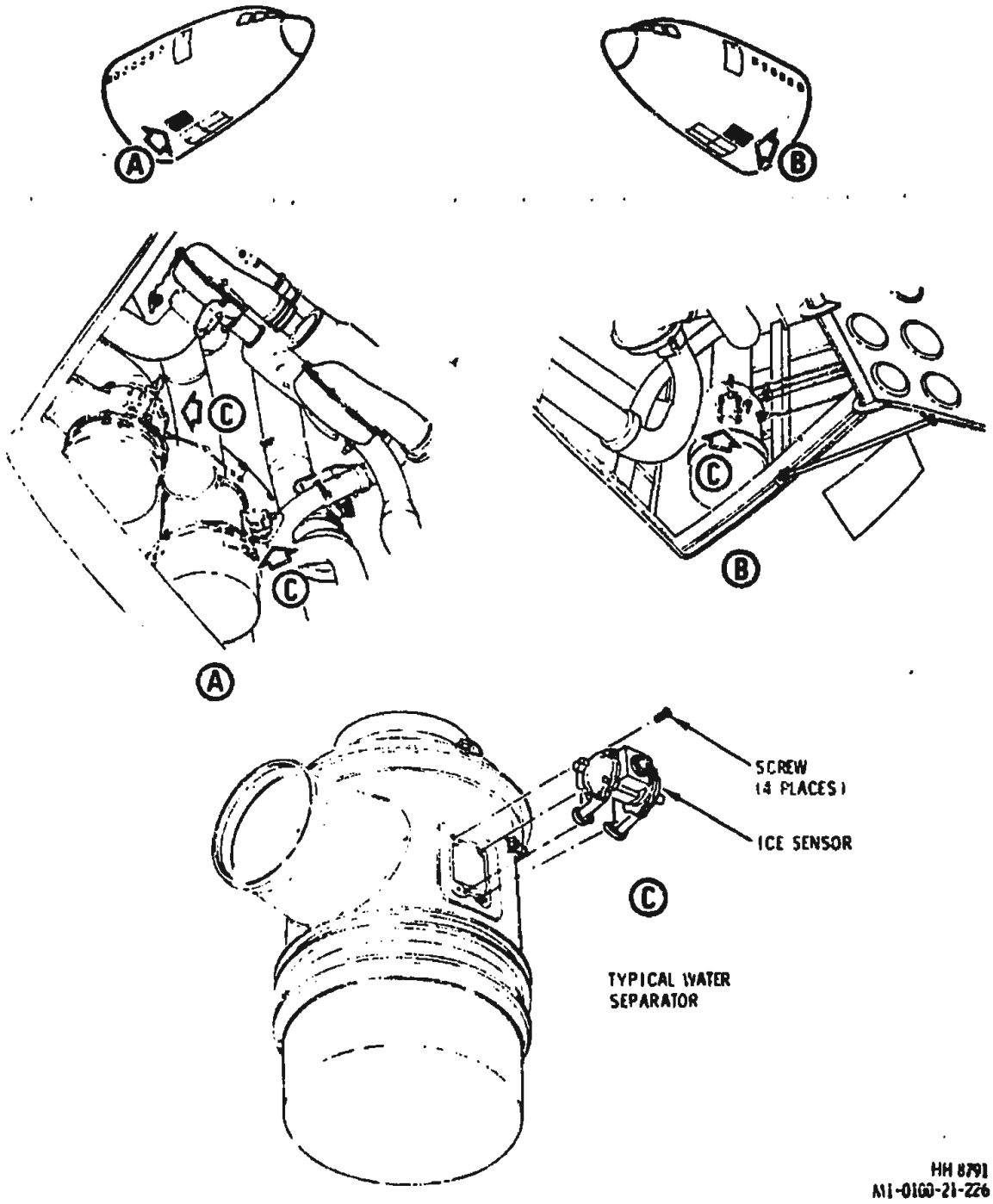
(4) Position sensor on water separator mounting pad and install screws.

(5) Remove protective cap from electrical cable connector and connect electrical connector to sensor receptacle.

(6) Close ECS compartment door.

(7) Remove tags and close circuit breakers opened in Step 4A(1).

(8) Operate ECS pack with new sensor in AUTO mode (Ref. 21-00-00).



Pack Ice Sensor
Removal and Installation
Figure 401

EFFECTIVITY: 001-031 WITHOUT SB21-115

PACK DISCHARGE TEMPERATURE SENSOR - REMOVAL AND INSTALLATION

1. General

The discharge temperature control sensor for pack 1 is located in zone 117 and the sensors 2 and 3 are located in zone 118. Sensors are accessible through the environmental control system
R (ECS) access doors 117AL and 118CR. Each sensor is mounted in the respective pack discharge duct downstream of the water separator.

NOTE: The pack discharge temperature sensors are located near the pack discharge overtemperature switches (Ref. 21-21-24) and the pack flow rate transducers (Ref. 21-63-05). These sensors can be confused with one another. The pack discharge temperature sensor can be distinguished from others by the shape of its mounting flange which is either heel-shaped or rectangular (Ref. Fig. 401).

2. Equipment and Materials

Gasket, Lockheed PN 1514103-101, or equivalent

3. Removal/Installation

A. Removal

WARNING: PLACARD FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

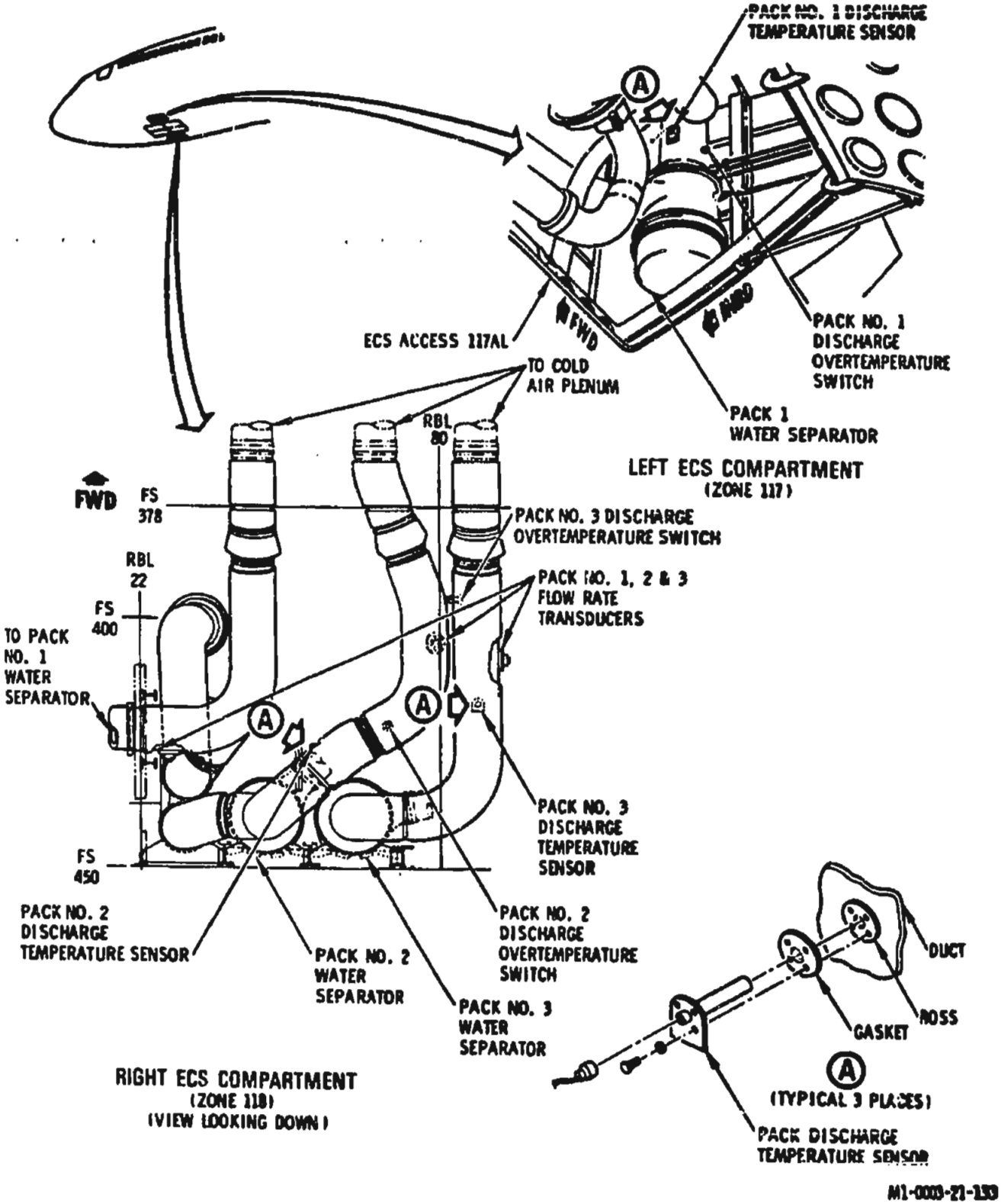
RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) On Flight Engineer/Second Officer aft circuit breaker panel CB3, zone 215, open and tag the applicable pack circuit breakers:

R PACK 1 - AUTO/MAN - DC (V5),

R PACK 1 - AUTO/MAN - AC (V6),

R PACK 2 - AUTO/MAN - DC (V7),



R Pack Discharge Temperature Sensors - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

R PACK 2 - AUTO/MAN - AC (V8),

R PACK 3 - AUTO/MAN - DC (V17),

R PACK 3 - AUTO/MAN - AC (V18).

(2) Open ECS compartment door 117AL for pack 1 or 118CR for packs 2 and 3.

(3) Disconnect electrical connector on sensor.

(4) Remove four screws and washers attaching the sensor to the duct.

(5) Remove sensor from duct.

(6) Remove and discard the gasket on the sensor.

B. Installation

WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Verify applicable circuit breakers listed in Step 3A(1) are open.

(2) Install a new gasket (Lockheed PN 1514103-101) on sensor mounting surface.

(3) Position sensor into the duct.

(4) Install four washers and screws to attach sensor to duct.

(5) Connect electrical connector on sensor.

(6) Close applicable ECS compartment access door 117AL or 118CR.

(7) Remove tags and close circuit breakers opened in Step 3A(1).

(8) Remove placards installed in Paragraph 3.

RAM AIR/TURBINE BYPASS POSITION INDICATOR REMOVAL AND INSTALLATION

1. General

The Ram Air/Turbine Bypass Position Indicators are electrically connected to the Ram Air Exhaust Valve Actuator or the Turbine Bypass Valve. The indicators provide a means for determining the position of the Ram Air Exhaust Valve/Turbine Bypass Valve. The Ram Air/Turbine By-pass Position Indicators are located in Integrated Pneumatic Systems (IPS) panel at the Flight Engineer/Second Officers (FE/SO) station.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers aft circuit breaker
R panel, CB3, zone 215, open and tag the applicable following circuit breakers:

PACK 1-AUTO/MAN - DC (V5)

PACK 2-AUTO/MAN - DC (V7)

PACK 3-AUTO/MAN - DC (V17)

(2) Loosen instrument clamp screw on the outside edge of the instrument.

(3) Pull instrument out and disconnect electrical connector on the back of the instrument. Secure electrical connector to prevent it from falling down into the panel.

(4) Install protective caps on electrical connector if
R immediate replacement of instrument can not be
R accomplished.

B. Installation

(1) Verify circuit breakers listed in Step 4A(1) are opened and tagged.

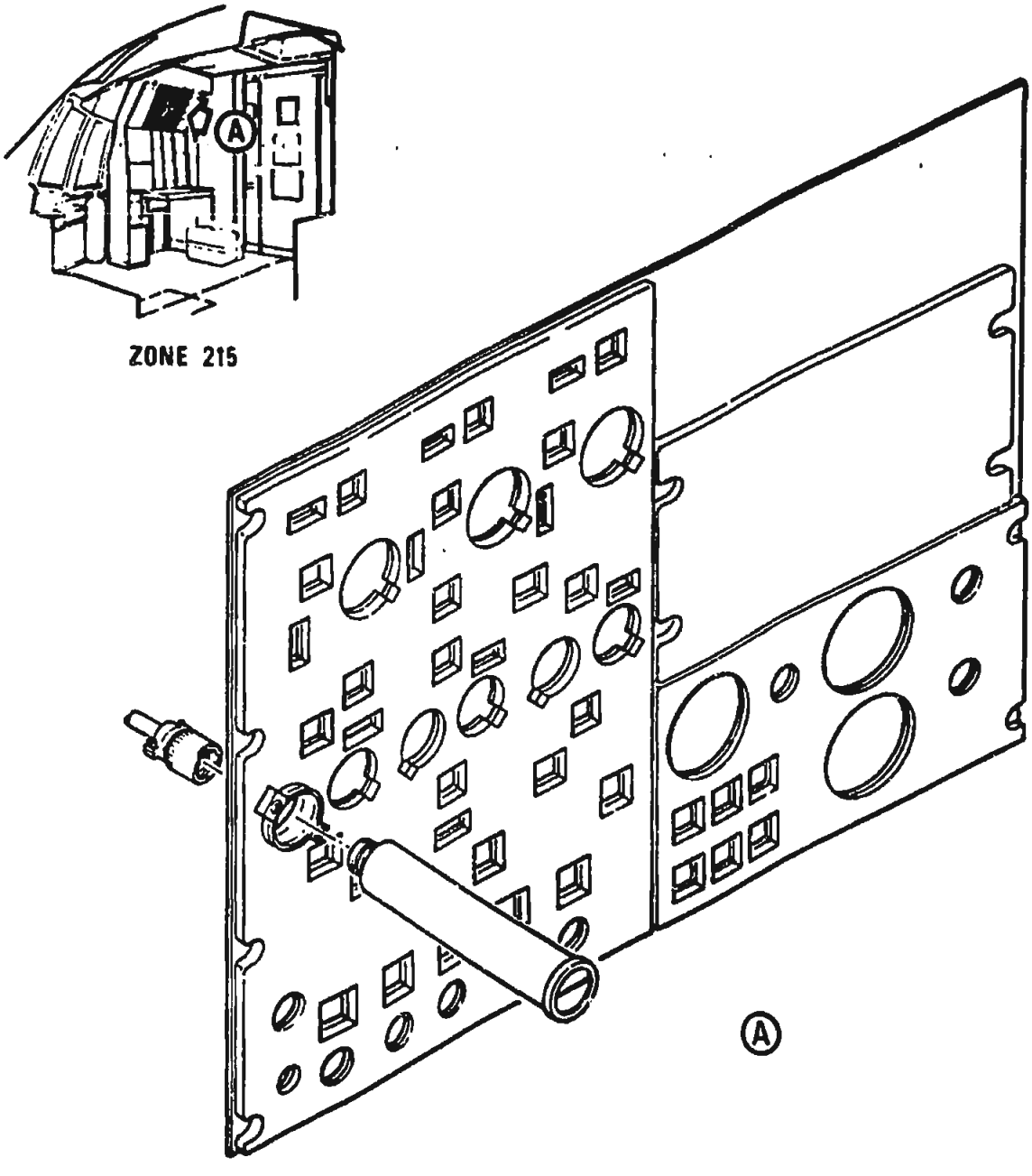
(2) Remove protective cap from electrical connector and connect electrical connector to the receptacle on the back of the instrument.

(3) Slide instrument into its hole in the panel.

(4) Align instrument face in proper position and tighten instrument clamp screw.

(5) Remove tags and close circuit breakers opened in Step 4A(1).

R R (6) Release AUTO-MAN switchlight of applicable PACK. Press COOL button until the TURB BYP indicator reads full CCW. (TURB BYP will not move until RAM AIR indicator reads full CCW). Release COOL button and press WARM button until the TURB BYP indicator reads full CW, the RAM AIR indicator should then move from the cooler position to the full CW position.



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R RAM AIR/TURBINE BYPASS POSITION INDICATOR - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL
R
001B

INDICATING AND MONITORING SYSTEM - DESCRIPTION AND OPERATION

1. General

The indicating and monitoring system monitors the temperature at four points in each of the three air cycle pack systems, hot air manifold supply air from packs 2 and 3, and the airflow through each pack. The system is also used to monitor supply air duct and ambient air temperature in each of the five temperature control zones (flight station; forward, mid, and aft cabin; and galley).

The system includes 24 sensors and three airflow rate transducers located as listed in Tables 1 and 2. Three indicators and four switches on the ECS MONITOR panel and three signal conditioners complete the system.

R On aircraft with SB21-111,
R the pack flow rate indicating system, including the associated
R signal conditioner and three flow transducers, is deactivated.

ECS Temperature Sensor and Pack Flow Transducer Location
Table 1

SENSOR OR TRANSDUCER	LOCATION					
	PACK 1		PACK 2		PACK 3	
	ZONE	STATION	ZONE	STATION	ZONE	STATION
Pack inlet	117	410	118	410	118	410
Compressor discharge	117	405	118	410	118	408
Turbine inlet	117	401	118	421	118	408
ACM discharge	114	380	114	380	114	380
Hot manifold			118	391	118	391
Pack flow	116	427	116	403	116	408

Cabin Temperature Sensor Locations
Table 2

CABIN TEMP SENSOR	SENSOR LOCATION			
	ZONE SENSOR		DUCT SENSOR	
	ZONE	STATION	ZONE	STATION
On aircraft 001-025 without SB21-088				
Flight station	210	252	113	264
On aircraft 001-025 with SB21-088, and 026-999				
Flight Station	215	219	113	264
Forward cabin	230	565	233	436
Mid cabin	250	1020	234	543
Aft cabin	270	1580	234	543
Galley	134	703	123	514

A. Temperature Sensor

The temperature sensor is a pure platinum, wire-wound-type sensor. The platinum wire gives the probe a positive resistance characteristic with respect to temperature.

R R B. Pack Flow Rate Transducer (Installed but inactive on aircraft with SB21-111)

The pack flow rate transducer is a rotating iron vane wheel that develops a pulse signal when flowing air turns the wheel.

C. Temperature Probe Signal Conditioners

The two-channel temperature probe signal conditioner operates from platinum wire temperature sensors. The temperature range for channel one is 20 to 200 degrees F, and for channel two the range is -20 to 300 degrees C. Only channel two is used and the output is 0 to 5V dc to the ECS TEMP indicator on the ECS MONITOR panel, zone 215.

The 22-channel temperature probe signal conditioner is a sealed unit. Each channel operates from a platinum wire temperature sensor. Temperature range of channels 1 through 13 is 20 to 200 degrees F, and the range of channels 14

through 22 is -20 to 300 degrees C. The output of each channel is 0 to 5V dc. Each channel has an output to the aircraft integrated data system (AIDS). Six channels drive the ECS TEMP indicator and ten channels drive the CABIN TEMP indicator, both on the ECS MONITOR panel, zone 215.

D. Pack Rate Signal Conditioner/Amplifier (Inactive on aircraft with SB21-111)

The pack flow rate signal conditioner/amplifier is a three-channel, sealed unit. Each channel operates with an independent pack flow rate transducer. Each channel input signal from the flow rate transducer is a pulsating electrical signal, and output to the indicator is 0 to 5V dc. Pack flow rate indication range is 0 to 3500 cubic feet per minute (CFM).

2. Operation

The indicating and monitoring system (Ref. Fig. 1 and 2) temperature sensors are mounted in ducts and occupied areas to sense supply and ambient air temperatures.

R The signals from the pack duct temperature sensors (Ref. Fig. 2) go to the PACK SELECT switch on the ECS MONITOR panel. Signals from only one set of pack temperature sensors may be monitored at one time. The selected signals are sent to the ECS temperature selector switch where the sensor location can be selected. The selected signal then goes to a signal conditioner where it is converted to dc and applied to the ECS indicator.

On aircraft without SB21-111, the pack flow rate transducer signal is an ac voltage that is proportional to airflow. The signal is sent through the PACK SELECT switch to a signal conditioner where it is converted to dc for use by the PACK FLOW indicator. Three potentiometers are used to adjust each pack flow signal to trim the aircraft electrical installation.

The signals from the cabin area and duct temperature sensors (Ref. Fig. 2) go to the cabin temperature select switch. Selected signals then go to the TEMP SELECT switchlight. When the switchlight is depressed (latched in), the DUCT legend comes on. When the switchlight is released (out), the ZONE legend comes on. From the TEMP SELECT switchlight, the selected signal goes to the temperature probe signal conditioner where it is changed to dc. The signal then goes to the CABIN temperature indicator.

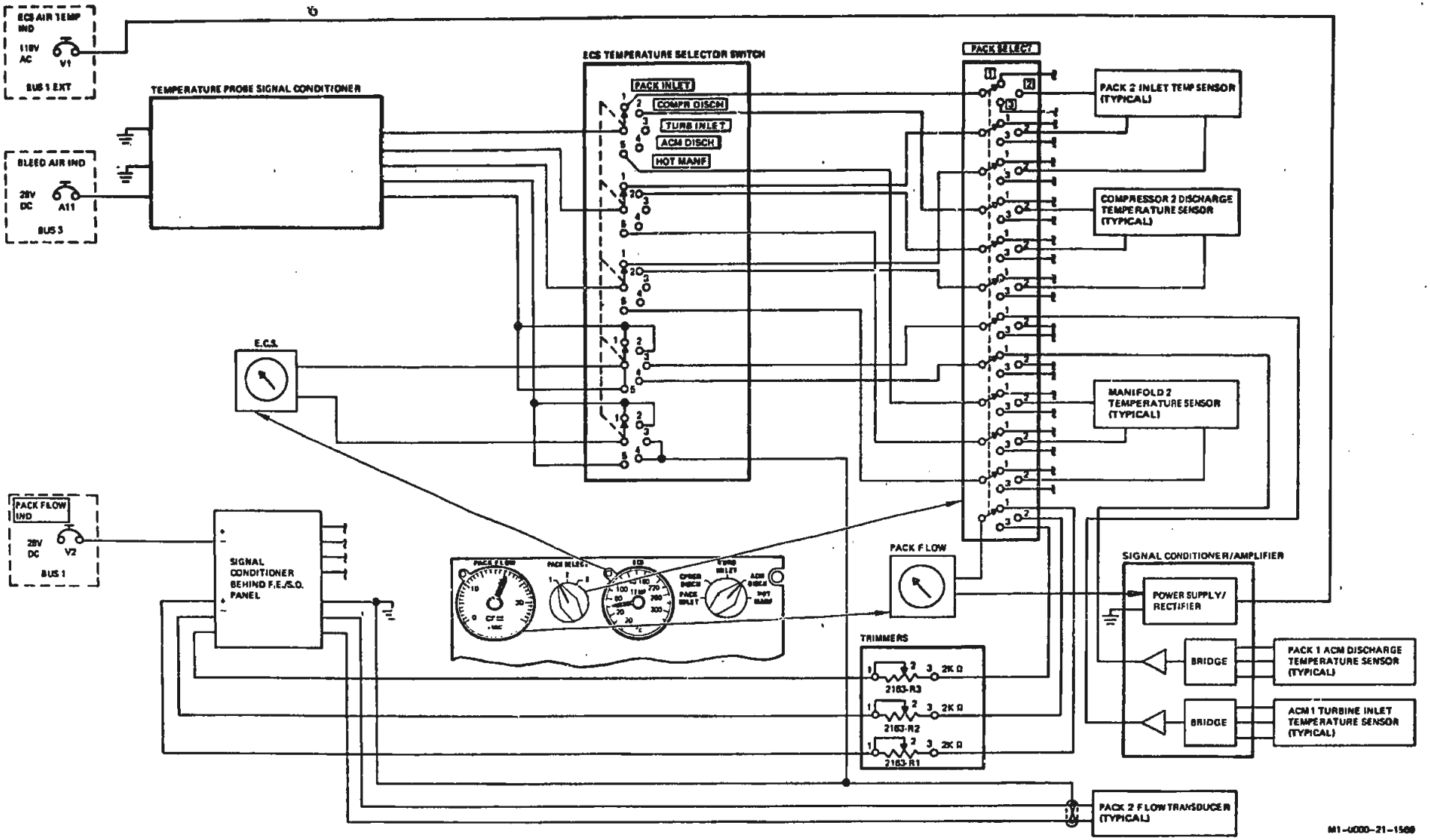
Lighting voltage for the three indicators is 5V ac.

3. Pack Flow Rate Transducer (Inactive on aircraft with SB21-111)

A. Description and Operation

The pack flow rate transducer is a device used to measure airflow (Ref. Fig. 3). A transducer is mounted in each of the three pack inlets to the cold air plenum. Each transducer consists of a mounting plate, a support tube, and
R a hollow cylinder with a rotating iron vane wheel mounted inside. Inside the support tube is a permanent magnet inserted in a coil of wire. An electrical connector on the mounting plate completes the transducer.

The pack flow rate transducer is an air-driven generator. When the probe is inserted in the airstream, the passing air turns the wheel. Each time one of the iron vanes passes the permanent magnet, the magnetic field changes. This change is picked up by the coil and sent to the flow signal conditioner for conversion to a dc voltage proportionate to CFM as displayed on the PACK FLOW indicator on the ECS MONITOR panel.



R R Pack Flow Monitor System Simplified Schematic
Figure 1

EFFECTIVITY: ALL

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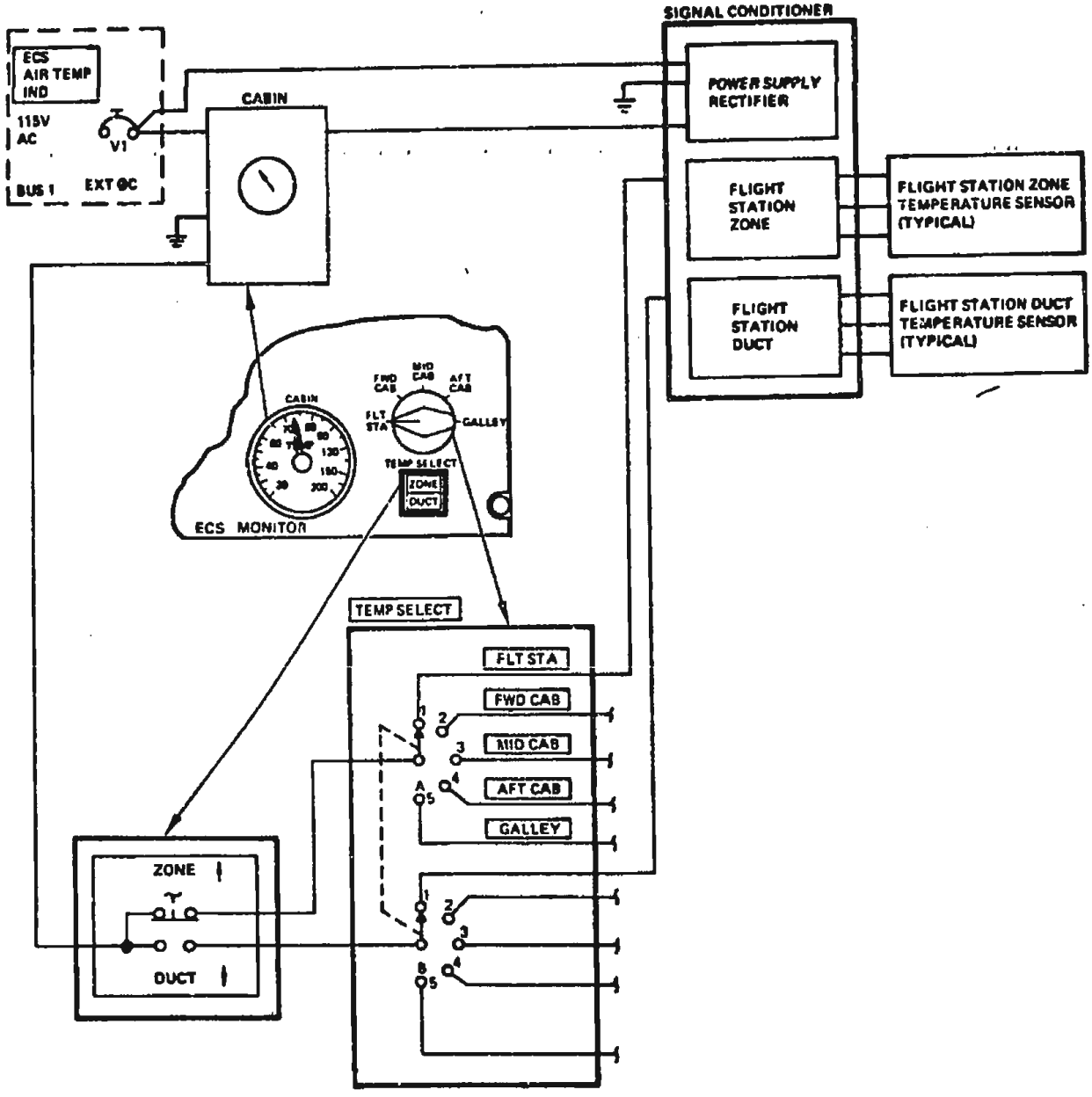

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R ECS Monitor System Simplified Schematic
R Figure 2

R EFFECTIVITY: ALL

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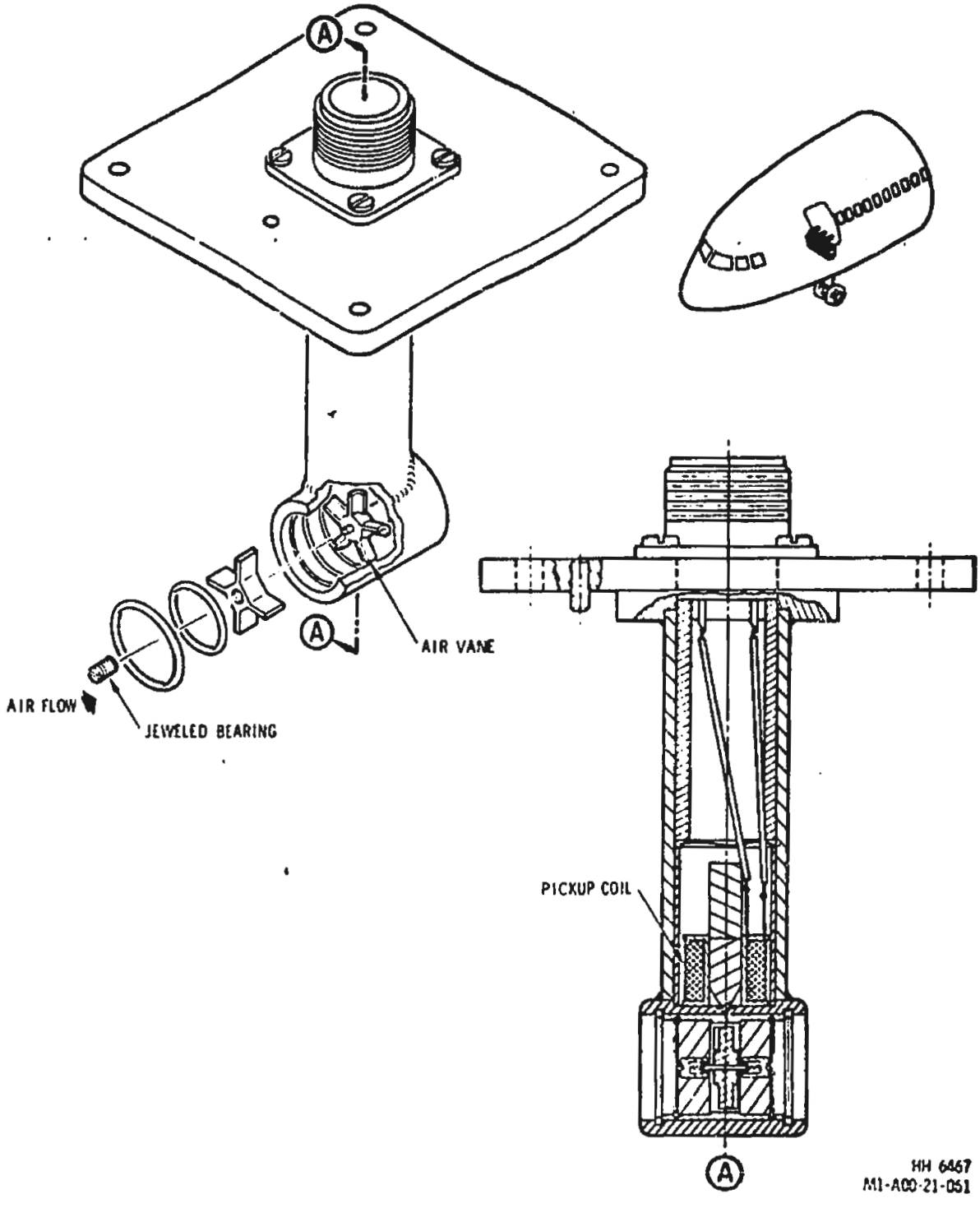

Pack Flow Sensor
Figure 3

INDICATING AND MONITORING SYSTEM - FAULT ISOLATION

1. General

R On aircraft with SB21-111,
R pack flow indicating system has been deactivated.

Reference data and fault isolation procedures for troubleshooting Indicating and Monitoring system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and inlcude cross-reference index to the wiring diagram manual pages required for checking component interconnection wiring.

Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Indicating and Monitoring system. It gives the area and access of each component and its respective removal and installation reference.

Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

2. Fault Isolation/Identification

Table 101 is a list of all fault isolation data in this section of the manual.

Table 101

	FIGURE	TITLE
	101	Component Location Index
	102	Component Locator Diagram
	103	CABIN TEMP Indicator Fault
	104	ECS TEMP Indicator Fault
R R	105	Any PACK FLOW Indicator Fault (On aircraft with SB21-111, system deactivated)
	SCHEM 1	Pack Temperature and Flow Monitor Schematic
	SCHEM 2	Flight Station, Galley, and Cabin Temperature Monitor Schematic

COMPONENT	QTY	AREA/ACCESS	REFERENCE
CIRCUIT BREAKERS:			
BLEED AIR INDICATOR 3621-CB1	1	FE/SO AFT CB PNL CB3/P23	•
ECS AIR TEMPERATURE INDICATOR 2163-CB1	1	FE/SO AFT CB PNL CB3/P23	•
PACK FLOW INDICATOR 2163-CB2	1	FE/SO AFT CB PNL CB3/P23	•
ECS MONITOR PANEL	1	FE/SO STATION, UPPER/P11	•
INDICATORS:			
CABIN TEMPERATURE 2163-M1	1	FE/SO ECS MONITOR PNL/P11	21-63-27
ECS PACK FLOW 2163-M3	1	FG/SO ECS MONITOR PNL/P11	21-63-03
ECS TEMPERATURE 2163-M2	1	FE/SO ECS MONITOR PNL/P11	21-63-09
SENSORS:			
ACM DISCHARGE TEMPERATURE – PACK 1 2163-A10	1	LH ECS COMPT/117AL	21-63-23
ACM DISCHARGE TEMPERATURE – PACK 2 2163-A11	1	RH ECS COMPT/118CR	21-63-23
ACM DISCHARGE TEMPERATURE – PACK 3 2163-A12	1	RH ECS COMPT/118CR	21-63-23
COMPRESSOR DISCHARGE TEMPERATURE – PACK 1 2163-P17	1	LH ECS COMPT/117AL	21-63-17
COMPRESSOR DISCHARGE TEMPERATURE – PACK 2 2163-P24	1	RH ECS COMPT/118CR	21-63-17
COMPRESSOR DISCHARGE TEMPERATURE – PACK 3 2163-P19	1	RH ECS COMPT/118CR	21-63-17
DUCT TEMPERATURE – AFT CABIN 2163-A16	1	ABOVE FWD CBN CEILING, ABOVE CENTERLINE MODULE/233AB	21-63-38
DUCT TEMPERATURE – FLIGHT STATION 2163-A22	1	FESC, AFT RIGHT SIDE/112AB	21-63-35
DUCT TEMPERATURE – FORWARD CABIN 2163-A20	1	ABOVE CABIN CEILING, ABOVE CENTERLINE MODULE/233AB	21-63-36
DUCT TEMPERATURE – GALLEY 2163-A14	1	FWD CARGO, LT WALL/123FL	21-63-34
DUCT TEMPERATURE – MID CABIN 2163-A18	1	ABOVE FWD CBN CEILING, ABOVE CENTERLINE MODULE/233AB	21-63-37

*SEE WM EQUIPMENT LIST

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Component Location Index
Figure 101 (Sheet 1)

R EFFECTIVITY: ALL
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COMPONENT	QTY	AREA/ACCESS	REFERENCE
HOT MANIFOLD TEMPERATURE – PACK 2 2163-P15	1	RH ECS COMPT, FWD/118CR	*
HOT MANIFOLD TEMPERATURE – PACK 3 2163-P16	1	RH ECS COMPT, FWD/118CR	*
PACK INLET TEMPERATURE – PACK 1 2163-P21	1	ON XBLD MANIFOLD/142DB	21-63-14
PACK INLET TEMPERATURE – PACK 2 2163-P22	1	ON XBLD MANIFOLD/142DB	21-63-14
PACK INLET TEMPERATURE – PACK 3 2163-P23	1	ON XBLD MANIFOLD/142DB	21-63-14
TURBINE INLET TEMPERATURE – PACK 1 2163-A7	1	LH ECS COMPT/117AL	21-63-20
TURBINE INLET TEMPERATURE – PACK 2 2163-A8	1	RH ECS COMPT/118CR	21-63-20
TURBINE INLET TEMPERATURE – PACK 3 2163-A9	1	RH ECS COMPT/118CR	21-63-20
ZONE TEMPERATURE – AFT CABIN 2163-A15	1	IN SENSOR BOX ON RH OVHD STOWAGE MODULE, FS 1023	21-63-33
ZONE TEMPERATURE – FLIGHT STATION 2163-A21	1	BEHIND AIR GRILLE BELOW FE/SO WORK TABLE	21-63-30
ZONE TEMPERATURE – FORWARD CABIN 2163-A19	1	IN SENSOR BOX ON RH OVHD STOWAGE MODULE, FS569	21-63-31
ZONE TEMPERATURE – GALLEY 2163-A13	1	GALLEY FWD BLKHD	21-63-34
ZONE TEMPERATURE – MID CABIN 2163-A17	1	IN SENSOR BOX ON RH OVHD STOWAGE MODULE, FS 1023	21-63-32
SIGNAL CONDITIONER – TEMPERATURE PROBE-2 CHANNEL 2163-A26	1	BEHIND ECS MONITOR PNL	21-63-40
SIGNAL CONDITIONER – TEMPERATURE PROBE-22 CHANNEL 2163-A29	1	FESC, REAR ELECTRONICS RACK/112AB	21-63-40
SIGNAL CONDITIONER/AMPLIFIER–PACK FLOW	1	BEHIND ECS MONITOR PNL	21-63-08
SWITCH – CABIN TEMPERATURE SELECT 2163-S3	1	FE/SO ECS MONITOR PNL	*
SWITCH – ECS TEMPERATURE SELECT 2163-S1	1	FE/SO ECS MONITOR PNL	*
SWITCH – PACK SELECT 2163-S2	1	FE/SO ECS MONITOR PNL	*
SWITCHLIGHTS: ZONE/DUCT TEMPERATURE SELECT 2163-DS1	1	FE/SO ECS MONITOR PNL	*

*SEE WM EQUIPMENT LIST

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R R Component Location Index
Figure 101 (Sheet 2)

R EFFECTIVITY: ALL
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COMPONENT	QTY	AREA/ACCESS	REFERENCE
TRANSDUCER, FLOW RATE – PACK 1 2163-MT1	1	NEAR TOP OF RH ECS COMPT/118CR	21-63-05
TRANSDUCER, FLOW RATE – PACK 2 2163-MT2	1	NEAR TOP OF RH ECS COMPT/118CR	21-63-05
TRANSDUCER, FLOW RATE – PACK 3 2163-MT3	1	NEAR TOP OF RH EC3 COMPT/119CR	21-63-05

*SEE WM EQUIPMENT LIST

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R Component Location Index
Figure 101 (Sheet 3)

R EFFECTIVITY: ALL
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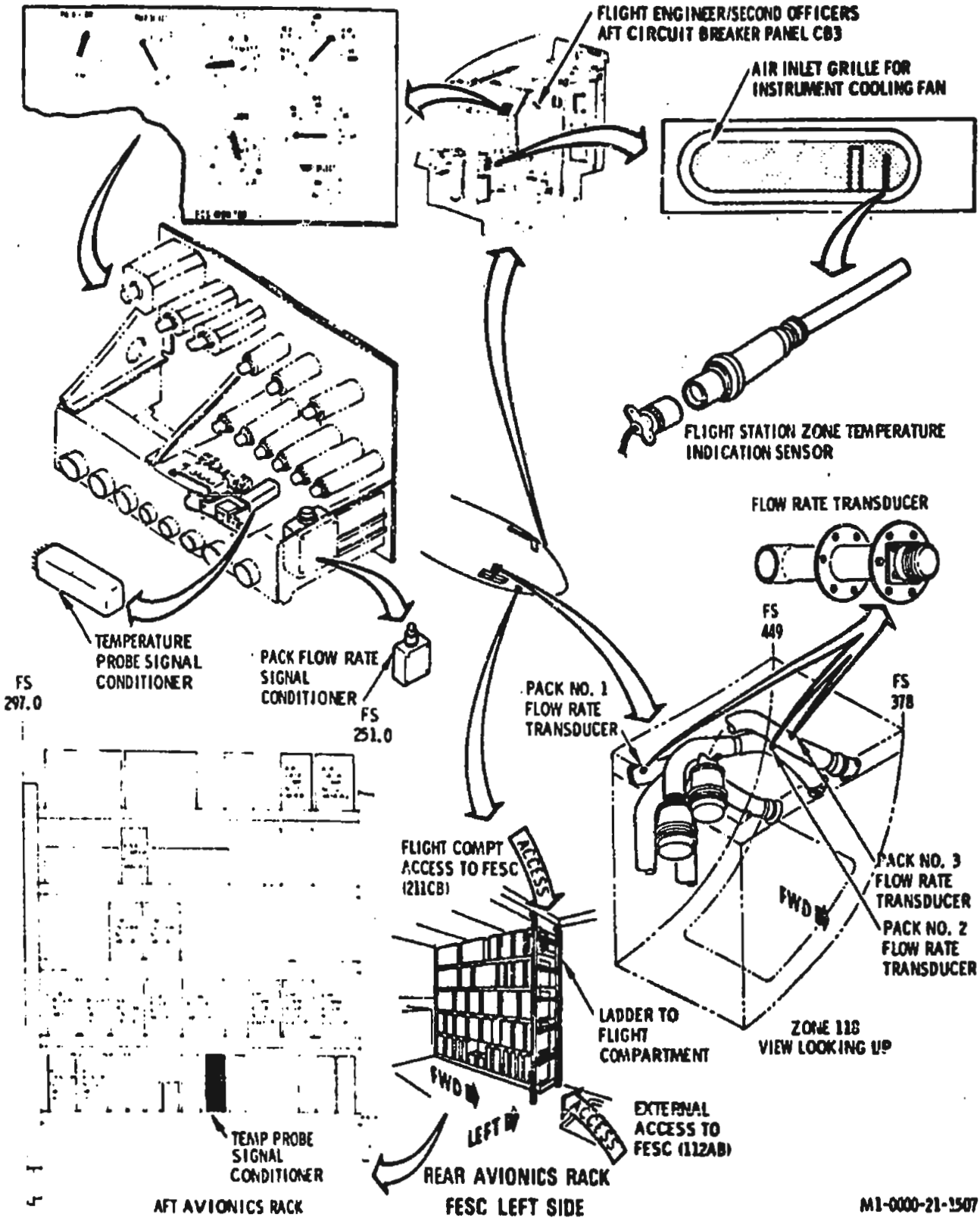

R R Component Locator Diagram
Figure 102 (Sheet 1)

R R EFFECTIVITY: ALL

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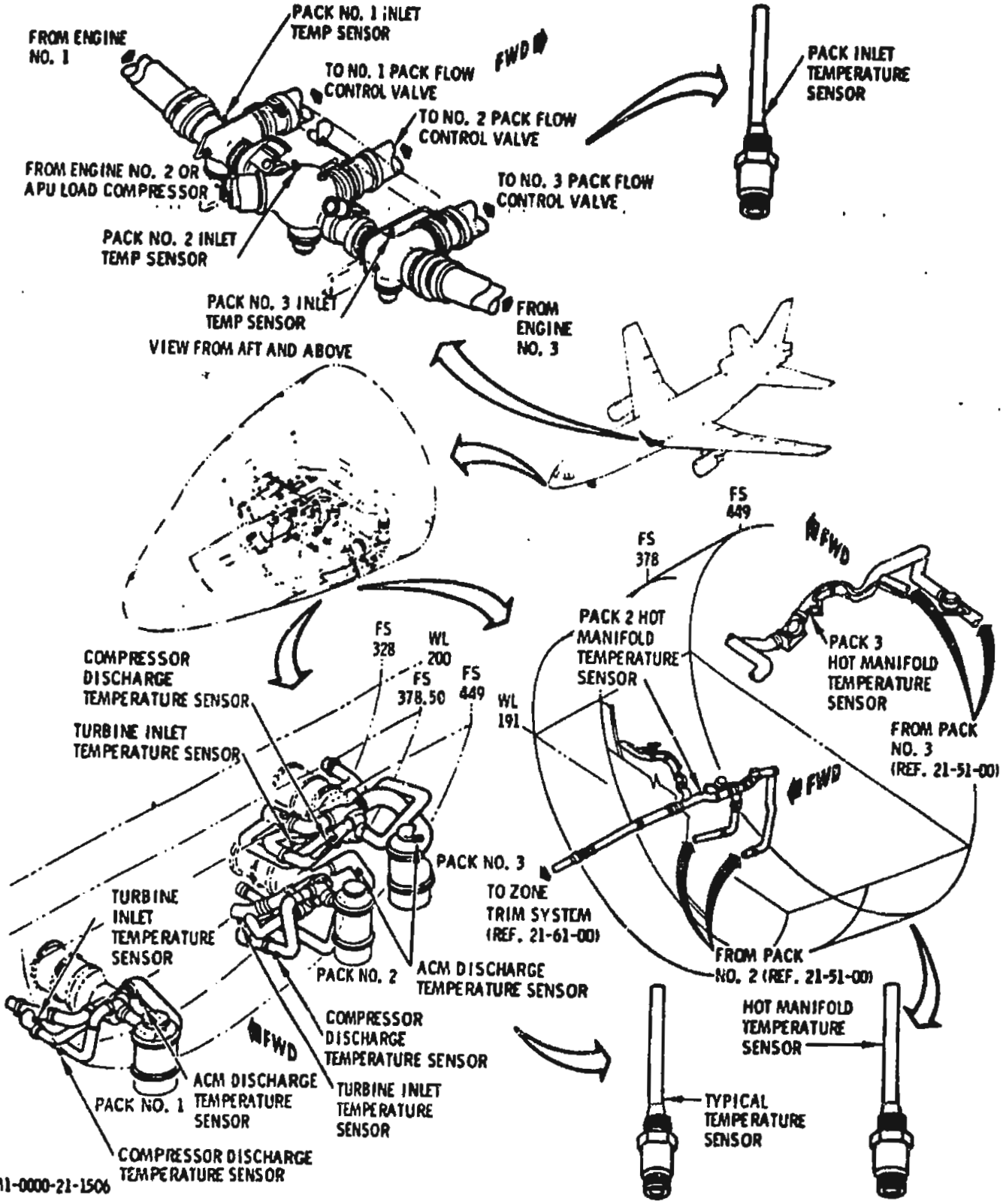
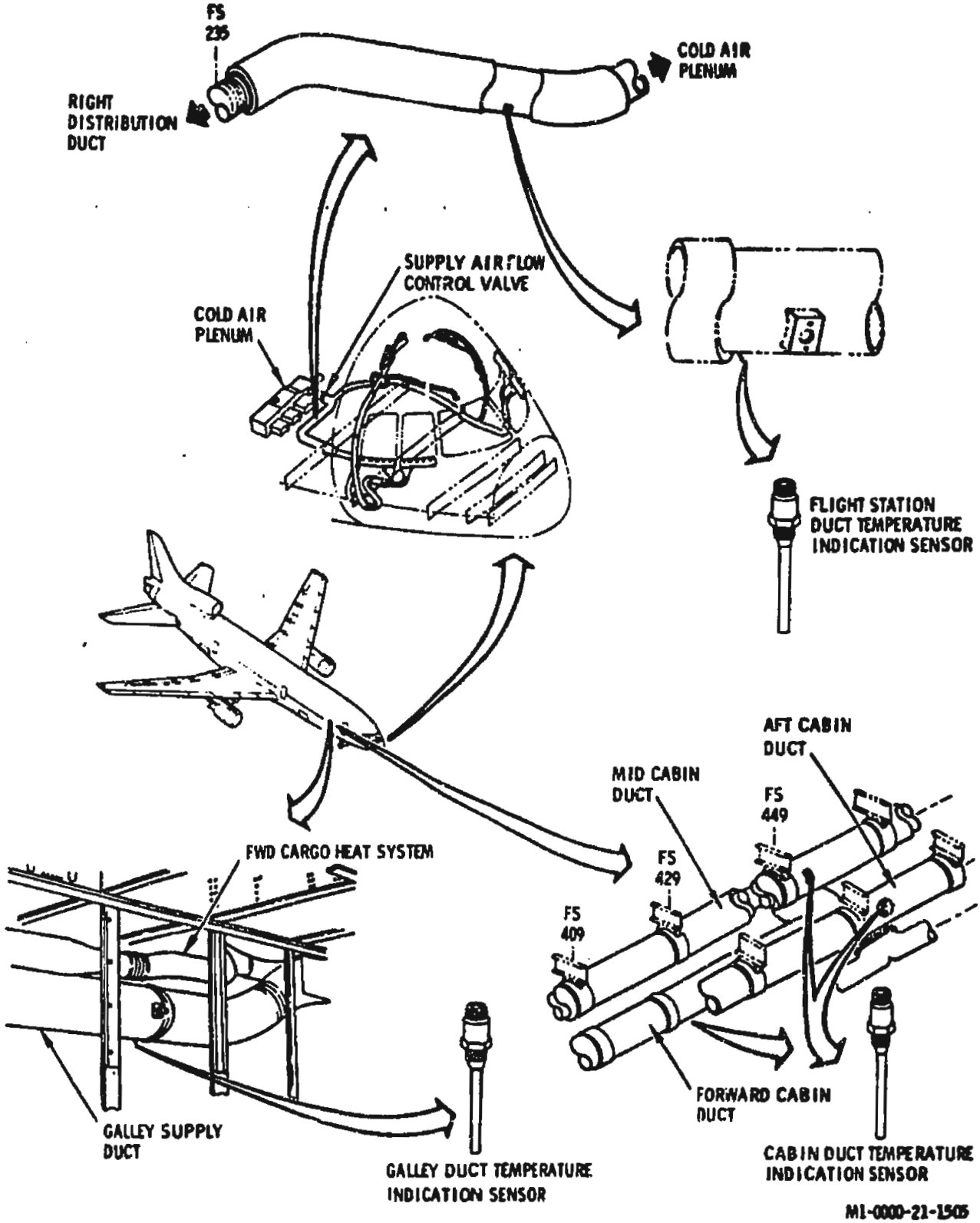


Component Locator Diagram
Figure 102 (Sheet 2)

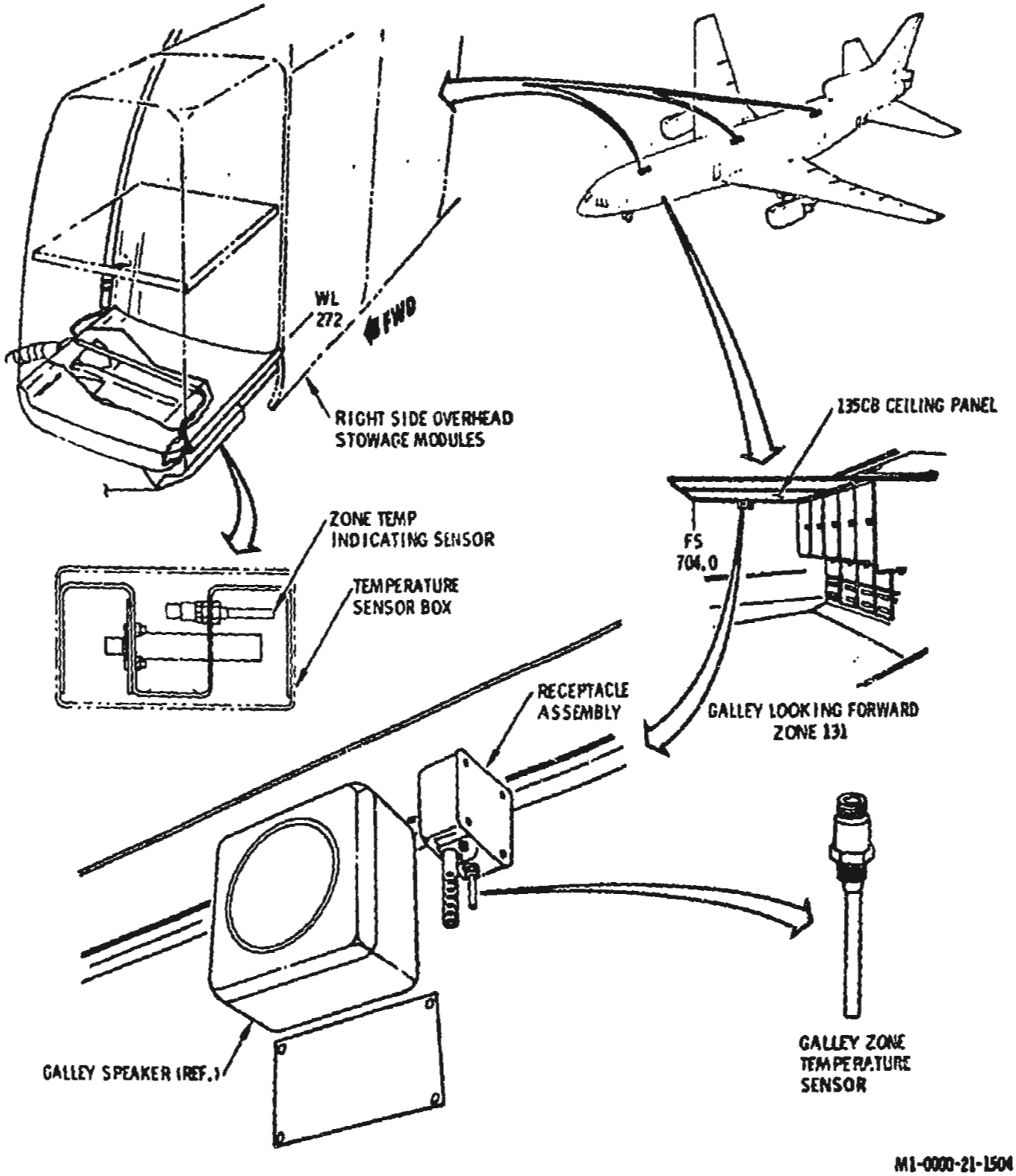
EFFECTIVITY: ALL



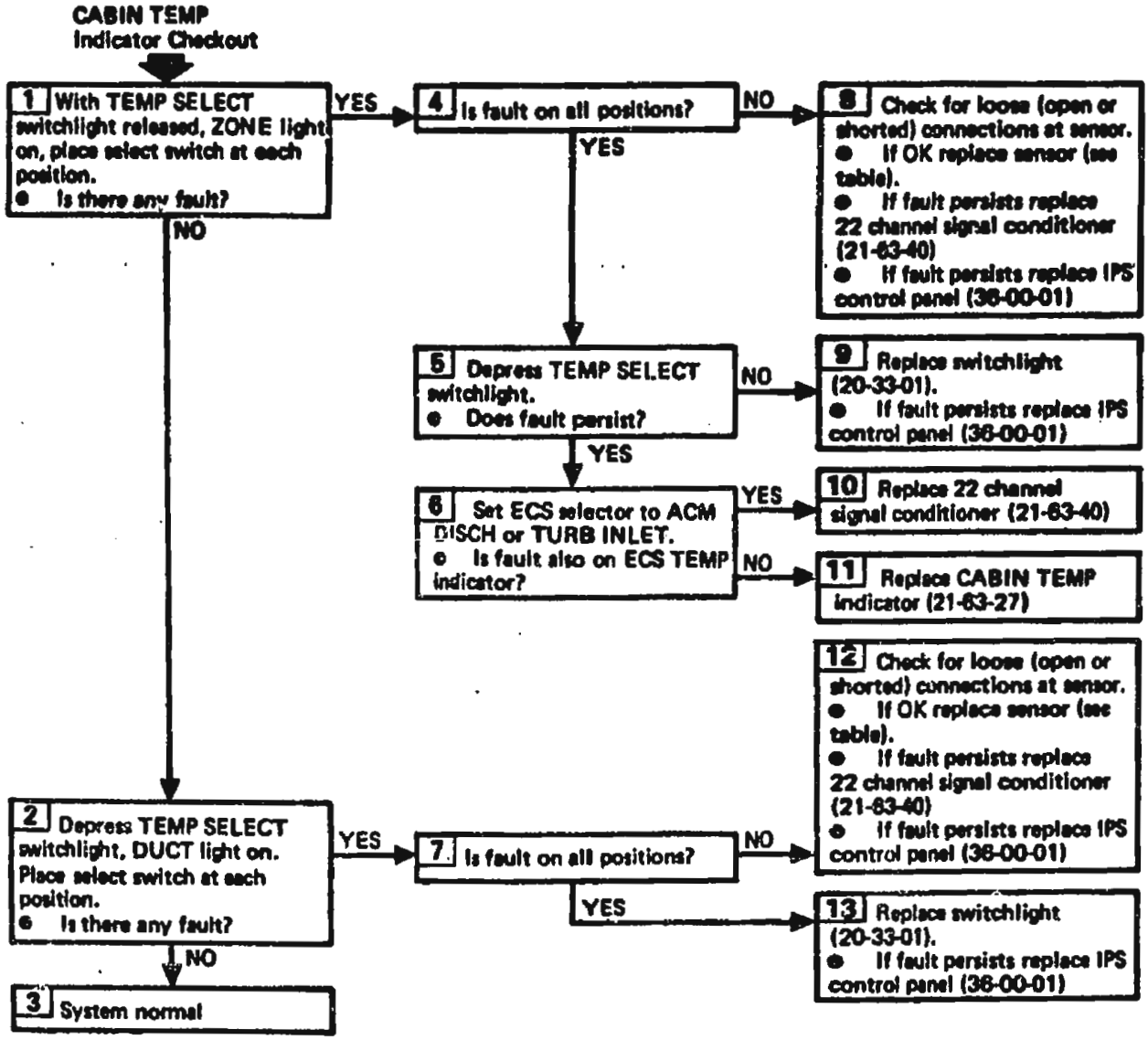
R
R Component Locator Diagram
Figure 102 (Sheet 3)

R EFFECTIVITY: ALL
R
R
001B

FORWARD CABIN ZONE TEMPERATURE SENSOR - FS 569 (9 WINDOWS AFT OF P2 DOOR)
MID CABIN ZONE TEMPERATURE SENSOR - FS 1023 (5 WINDOWS AFT OF P3 DOOR)
AFT CABIN ZONE TEMPERATURE SENSOR - FS1585 (2 WINDOWS AFT OF P4 DOOR)



Component Locator Diagram
Figure 102 (Sheet 4)


CABIN TEMP
Indicator Checkout
1 With TEMP SELECT switchlight released, ZONE light on, place select switch at each position.
● Is there any fault?
YES
4 Is fault on all positions?
NO
8 Check for loose (open or shorted) connections at sensor.
● If OK replace sensor (see table).
● If fault persists replace 22 channel signal conditioner (21-63-40)
● If fault persists replace IPS control panel (36-00-01)
YES
5 Depress TEMP SELECT switchlight.
● Does fault persist?
NO
9 Replace switchlight (20-33-01).
● If fault persists replace IPS control panel (36-00-01)
YES
6 Set ECS selector to ACM DISCH or TURB INLET.
● Is fault also on ECS TEMP indicator?
YES
10 Replace 22 channel signal conditioner (21-63-40)
NO
11 Replace CABIN TEMP indicator (21-63-27)
NO
2 Depress TEMP SELECT switchlight, DUCT light on. Place select switch at each position.
● Is there any fault?
YES
7 Is fault on all positions?
NO
12 Check for loose (open or shorted) connections at sensor.
● If OK replace sensor (see table).
● If fault persists replace 22 channel signal conditioner (21-63-40)
● If fault persists replace IPS control panel (36-00-01)
YES
13 Replace switchlight (20-33-01).
● If fault persists replace IPS control panel (36-00-01)
NO
3 System normal

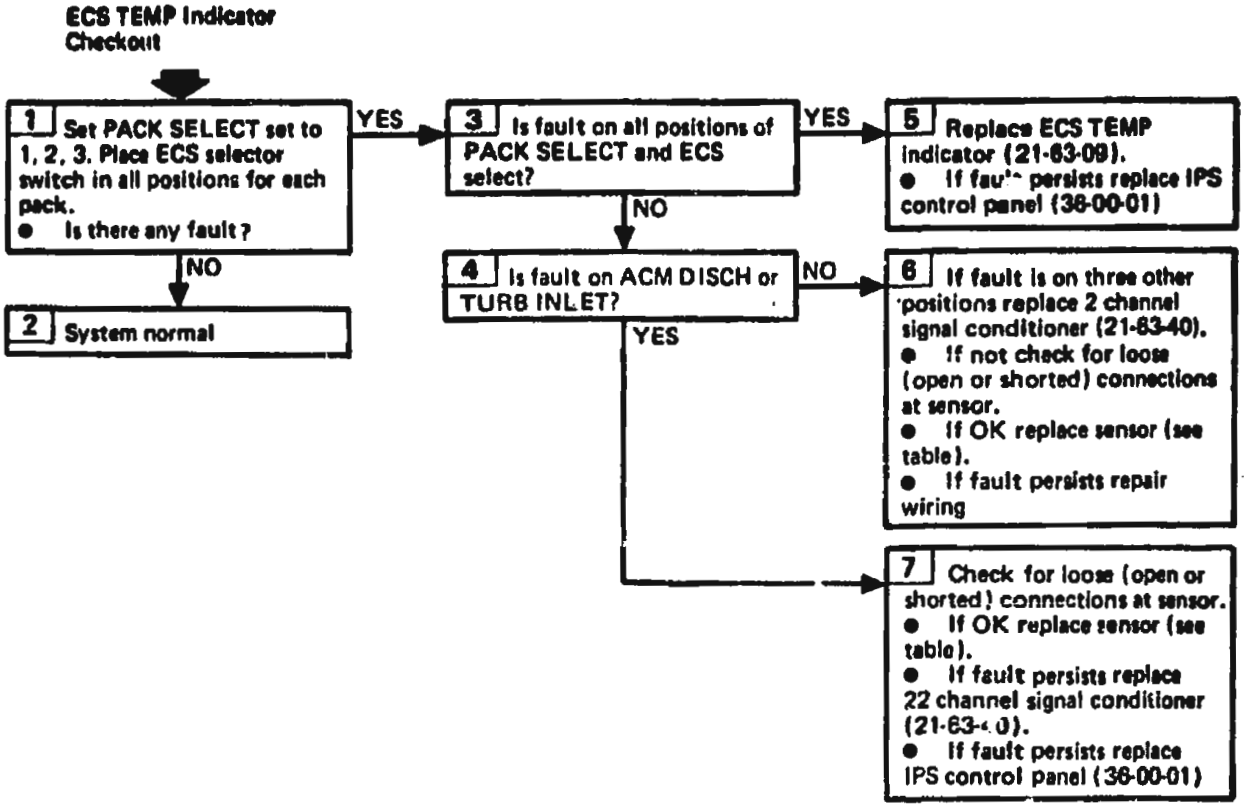
CABIN TEMP

SENSOR	ZONE R/I	DUCT R/I
FLT STA	21-63-30	21-63-35
FWD CAB, MID CAB	21-63-31	21-63-36
AFT CAB, GALLEY	21-63-34	21-63-39

PREREQUISITES
Electrical Power (24-00-00)
CB's: 3V1, 3R17

M1-5001-21-5079

CABIN TEMP Indicator Fault
Figure 103


ECS TEMP Indicator Checkout
1 Set PACK SELECT set to 1, 2, 3. Place ECS selector switch in all positions for each pack.
● Is there any fault?
YES
NO
2 System normal
3 Is fault on all positions of PACK SELECT and ECS select?
YES
NO
4 Is fault on ACM DISCH or TURB INLET?
NO
YES
5 Replace ECS TEMP indicator (21-63-09).
● If fault persists replace IPS control panel (36-00-01)
6 If fault is on three other positions replace 2 channel signal conditioner (21-63-40).
● If not check for loose (open or shorted) connections at sensor.
● If OK replace sensor (see table).
● If fault persists repair wiring
7 Check for loose (open or shorted) connections at sensor.
● If OK replace sensor (see table).
● If fault persists replace 22 channel signal conditioner (21-63-40).
● If fault persists replace IPS control panel (36-00-01)

SENSOR	R/I
PACK INLET	21-63-14
CPRSR DISCH	21-63-17
TURB INLET	21-63-20
ACM DISCH	21-63-23
HOT MANF	21-41-05

PREREQUISITES
Electrical Power (24-00-00)
Pneumatic Power (36-00-00)
CB's: 3R17, 3V1

M1-0002-21-5080

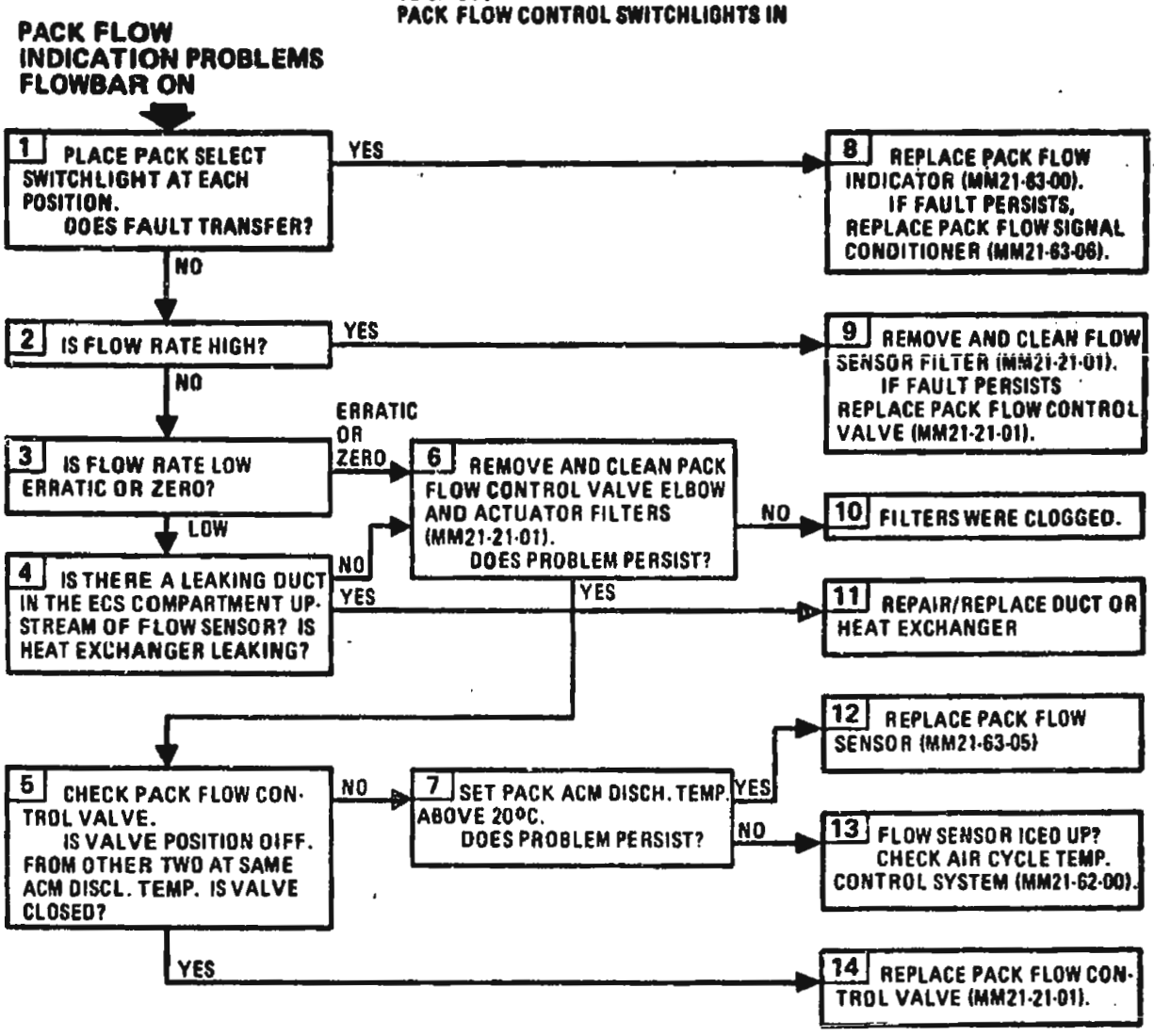
R
R

ECS TEMP Indicator Fault
Figure 104

EFFECTIVITY: ALL

001B

PREREQUISITES
ELECTRICAL POWER (MM24-00-00)
PNEUMATIC POWER (MM36-00-00)
CB'S: 3V2
PACK FLOW CONTROL SWITCHLIGHTS IN


PACK FLOW INDICATION PROBLEMS FLOWBAR ON
1 PLACE PACK SELECT SWITCHLIGHT AT EACH POSITION. DOES FAULT TRANSFER?
YES
8 REPLACE PACK FLOW INDICATOR (MM21-63-00). IF FAULT PERSISTS, REPLACE PACK FLOW SIGNAL CONDITIONER (MM21-63-06).
NO
2 IS FLOW RATE HIGH?
YES
9 REMOVE AND CLEAN FLOW SENSOR FILTER (MM21-21-01). IF FAULT PERSISTS REPLACE PACK FLOW CONTROL VALVE (MM21-21-01).
NO
3 IS FLOW RATE LOW ERRATIC OR ZERO?
ERRATIC OR ZERO
6 REMOVE AND CLEAN PACK FLOW CONTROL VALVE ELBOW AND ACTUATOR FILTERS (MM21-21-01). DOES PROBLEM PERSIST?
NO
10 FILTERS WERE CLOGGED.
LOW
4 IS THERE A LEAKING DUCT IN THE ECS COMPARTMENT UPSTREAM OF FLOW SENSOR? IS HEAT EXCHANGER LEAKING?
NO
YES
YES
11 REPAIR/REPLACE DUCT OR HEAT EXCHANGER
5 CHECK PACK FLOW CONTROL VALVE. IS VALVE POSITION DIFF. FROM OTHER TWO AT SAME ACM DISCL. TEMP. IS VALVE CLOSED?
NO
7 SET PACK ACM DISCH. TEMP. ABOVE 20°C. DOES PROBLEM PERSIST?
YES
12 REPLACE PACK FLOW SENSOR (MM21-63-05)
NO
13 FLOW SENSOR ICED UP? CHECK AIR CYCLE TEMP. CONTROL SYSTEM (MM21-62-00).
YES
14 REPLACE PACK FLOW CONTROL VALVE (MM21-21-01).

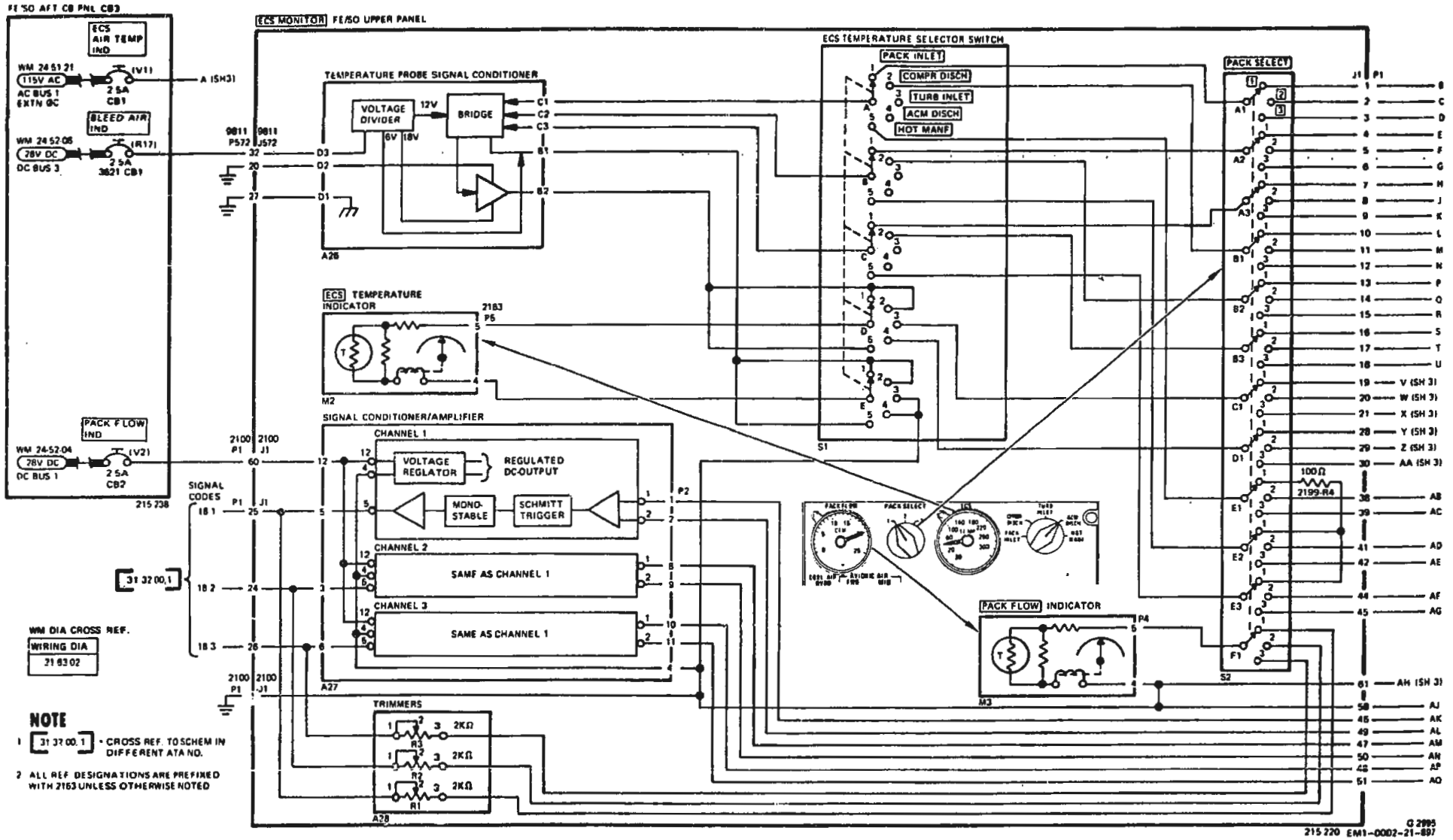
M1-0008-21-5037

R
R

Any PACK FLOW Indicator Fault
Figure 105

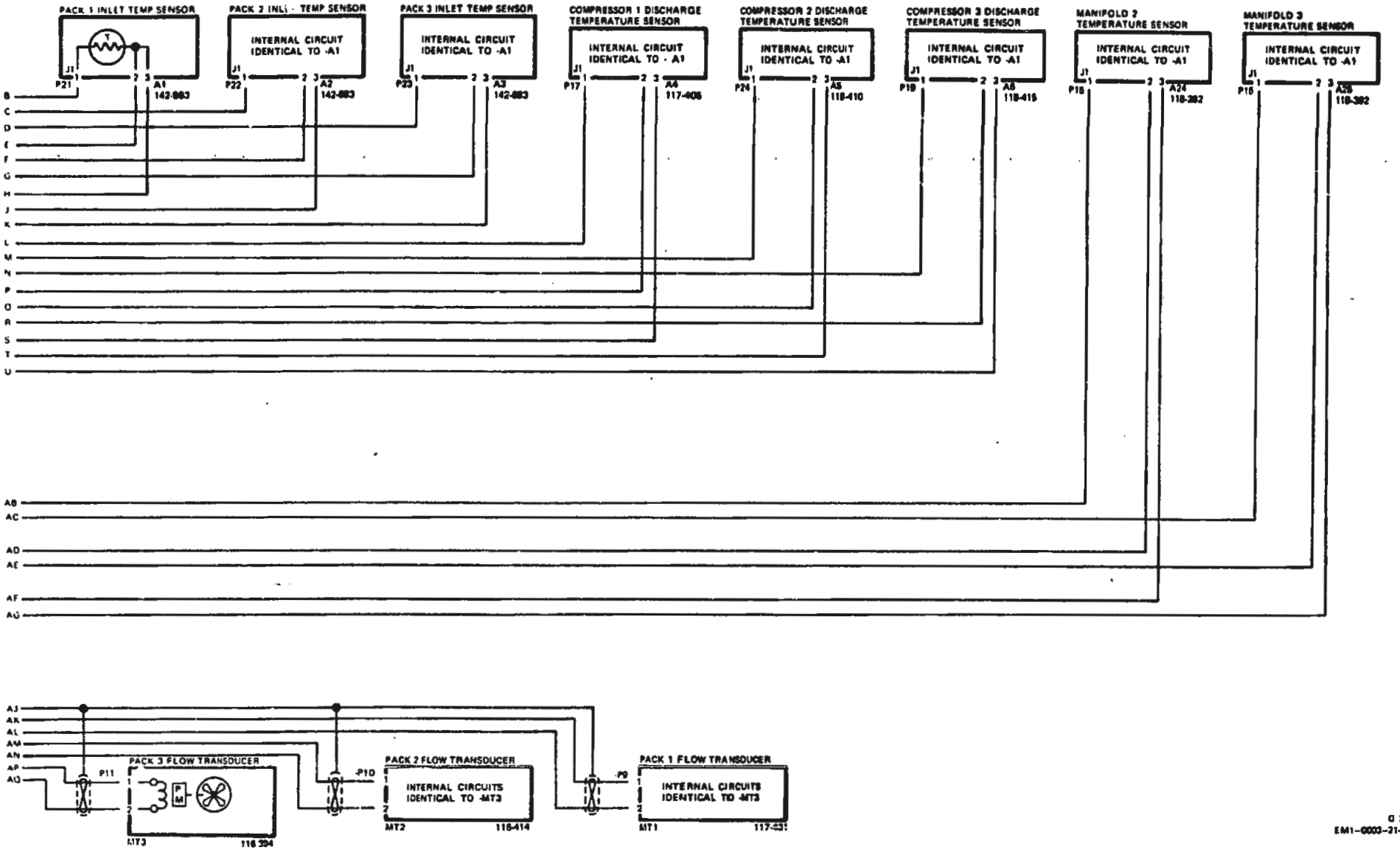
EFFECTIVITY: ALL

001B



Pack Temperature and Flow Monitor Schematic
SCHEM 1 (Sheet 1)

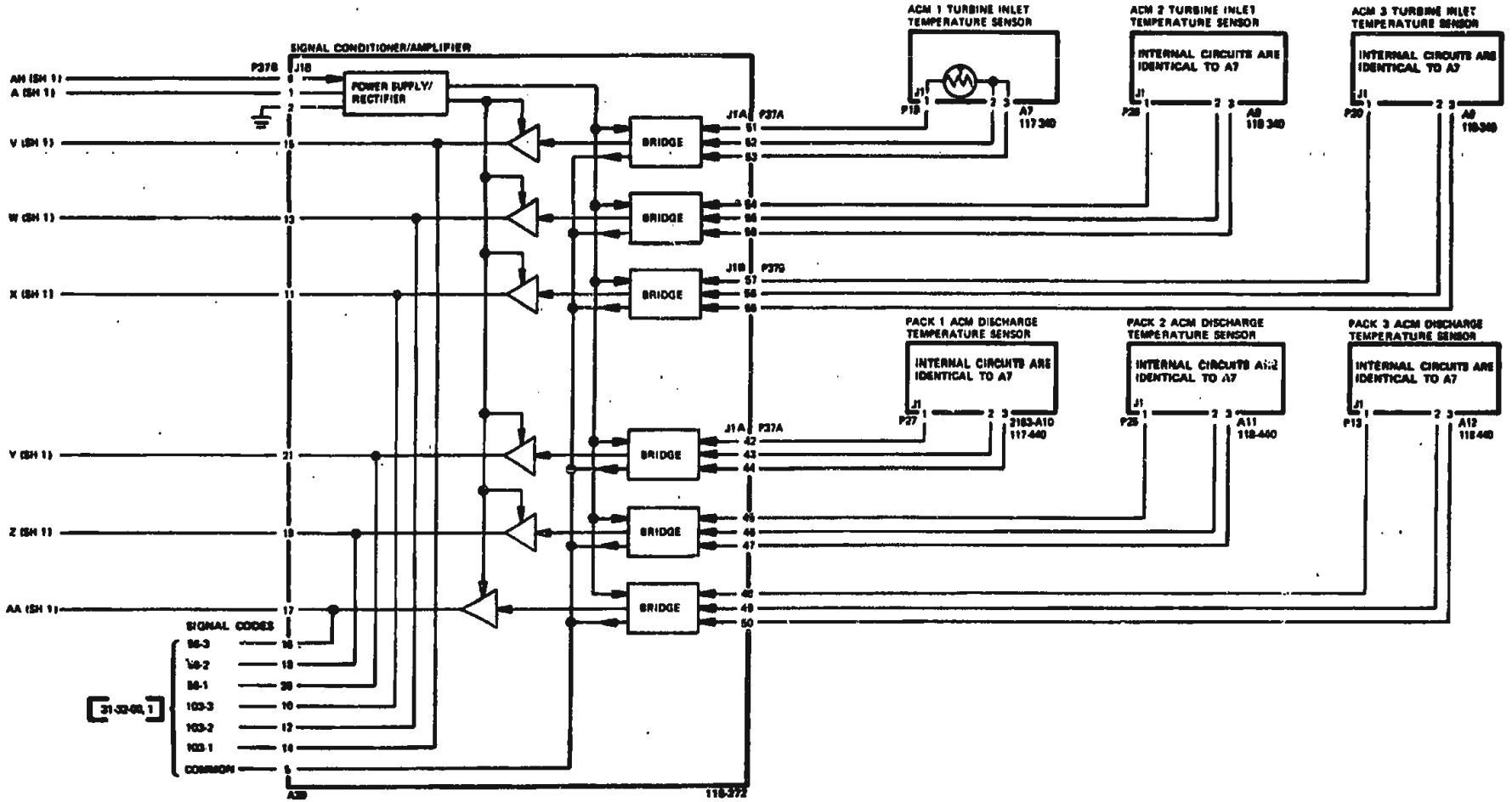
R EFFECTIVITY: ALL
R
001B


PACK 1 INLET TEMP SENSOR
PACK 2 INLET TEMP SENSOR
PACK 3 INLET TEMP SENSOR
COMPRESSOR 1 DISCHARGE TEMPERATURE SENSOR
COMPRESSOR 2 DISCHARGE TEMPERATURE SENSOR
COMPRESSOR 3 DISCHARGE TEMPERATURE SENSOR
MANIFOLD 2 TEMPERATURE SENSOR
MANIFOLD 3 TEMPERATURE SENSOR
INTERNAL CIRCUIT IDENTICAL TO -A1
PACK 3 FLOW TRANSDUCER
PACK 2 FLOW TRANSDUCER
PACK 1 FLOW TRANSDUCER
INTERNAL CIRCUITS IDENTICAL TO -MT3

CR Pack Temperature and Flow Monitor Schematic
CR SCHEM 1 (Sheet 2)

EFFECTIVITY: ALL

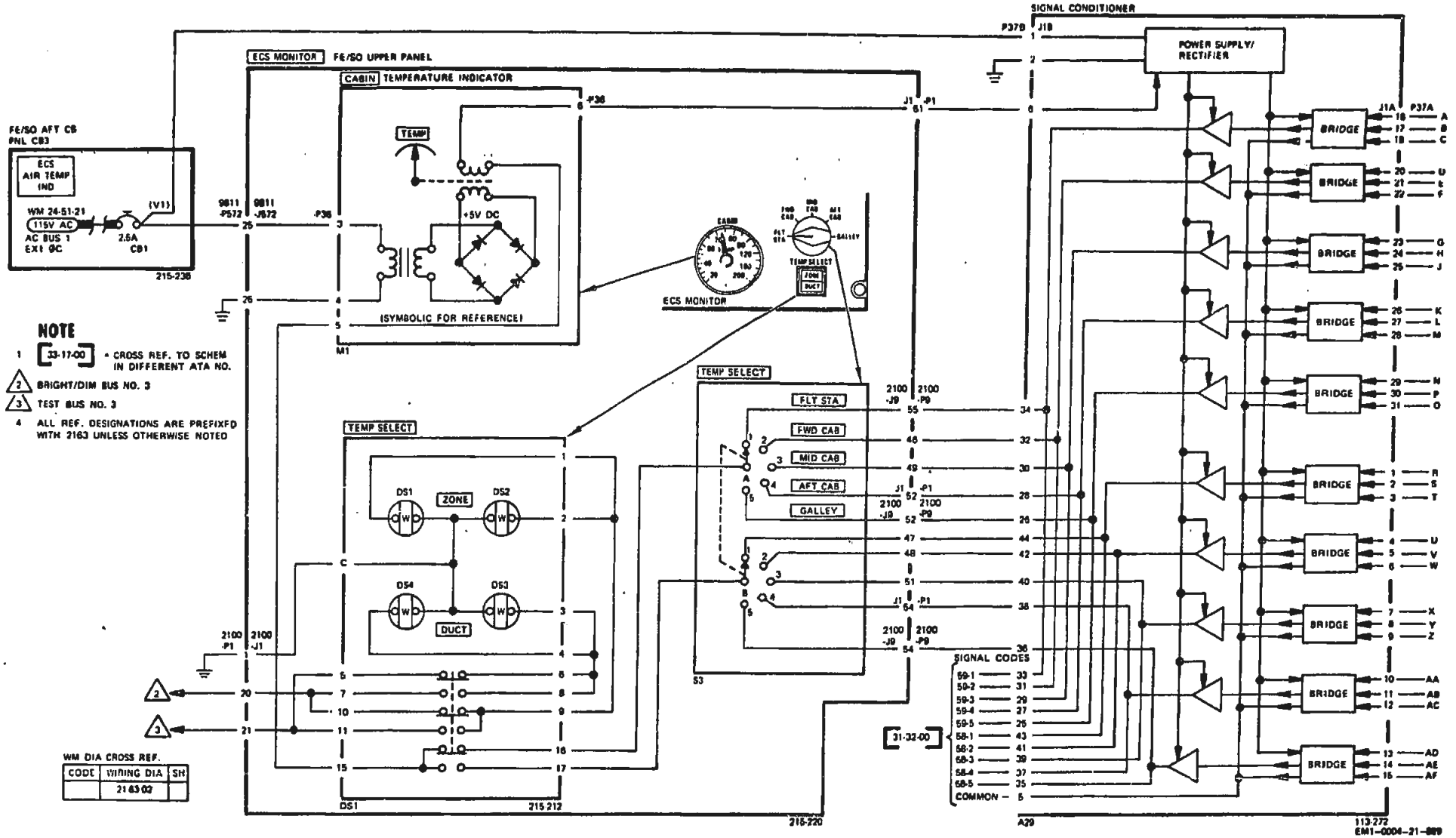
0018



R Pack Temperature and Flow Monitor Schematic
R SCHEM 1 (Sheet 3)

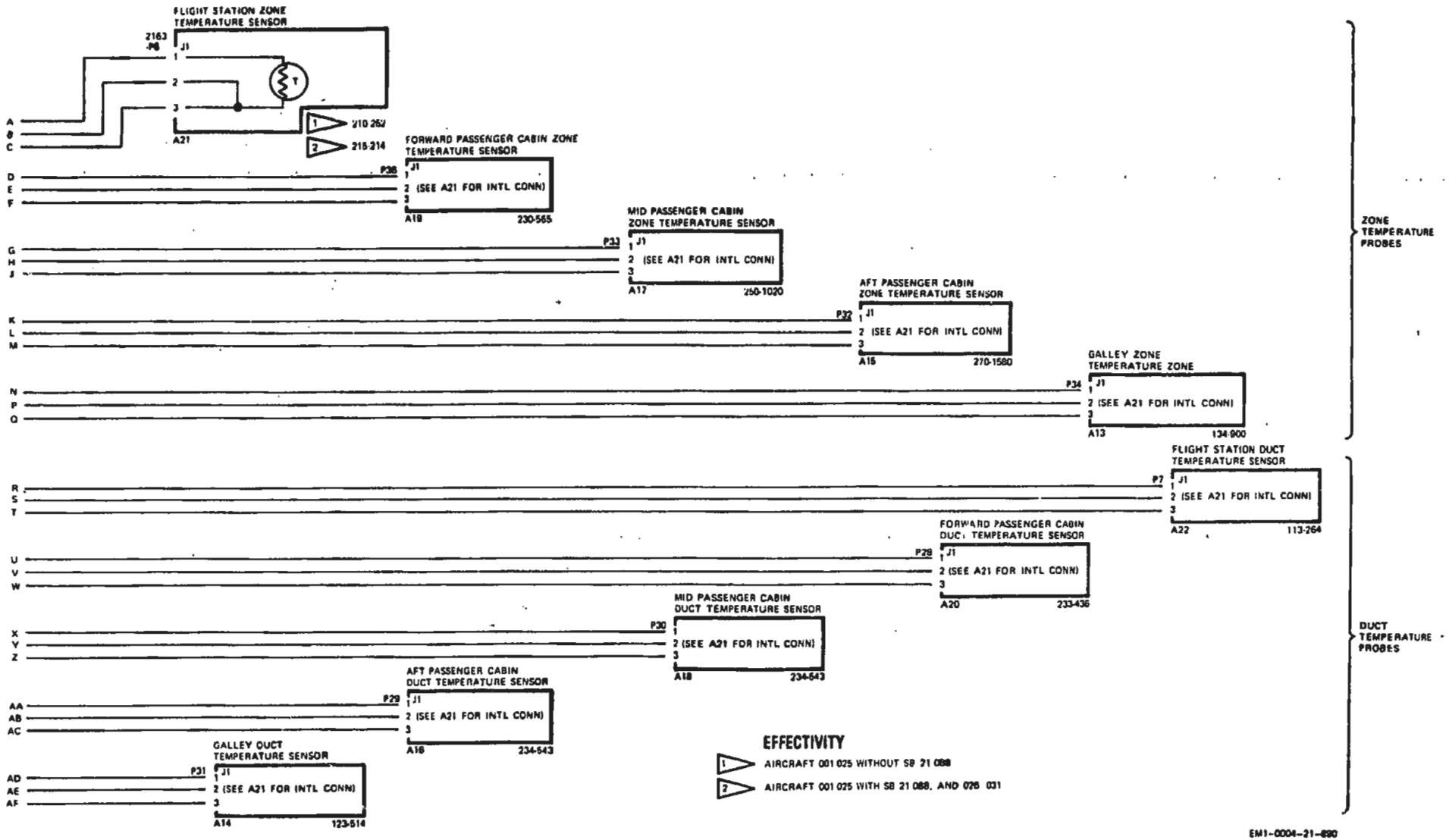
EFFECTIVITY: ALL

0018



Flight Station Galley, and Cabin Temperature
Monitor Schematic
SCHEM 2 (Sheet 1)

R EFFECTIVITY: ALL
R
0018



Flight Station, Galley and
Cabin Temperature Monitor Schematic
SCHEM 2 (Sheet 2)

EFFECTIVITY: ALL

001B

ECS PACK FLOW INDICATOR - REMOVAL AND INSTALLATION

1. General

R On aircraft with SB21-111,
R the pack flow indicating system has been deactivated.

The ECS Pack Flow Indicator is located in the ECS MONITOR panel which is part of the Integrated Pneumatic System (IPS) instrument panel. The IPS instrument panel is located at Flight Engineer/Second Officer (FE/SO), zone 215, upper instrument panel. Indicator access is from the front of the panel.

No adjustment is made for indicator replacement in aircraft.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

21-63-08 Pack Flow Signal Conditioner/Amplifier - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag PACK FLOW IND (V2) circuit breaker.

(2) At ECS MONITOR panel loosen round head screw adjacent to PACK FLOW indicator that secures indicator to panel.

(3) Pull PACK FLOW indicator out of hole in panel and remove connector plug from rear of indicator.

(4) Install protective caps on plug and receptacle.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective caps from connectors.

(3) Connect harness plug to indicator receptacle.

R (4) Insert indicator into ECS MONITOR panel, rotating
R indicator to level TEMP legend and secure by tightening
R round head clamp screw adjacent to indicator face.

R (5) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (6) Check for PACK FLOW operation for any one of the three
R packs (Ref. 21-63-08 Adjustment and Test).

PACK FLOW RATE TRANSDUCER - REMOVAL AND INSTALLATION

1. General

R On aircraft with SB21-111,
R pack flow rate transducers are inactive.

There are three pack flow rate transducers (Ref. Fig. 401). One transducer is mounted in each of the water separator discharge ducts to the cold air plenum in the top of the right hand environmental control system compartment, zone 118. Access is through compartment door 118CR.

2. Equipment and Materials

Protective caps and plugs

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers circuit breaker panel CB3, zone 215, open and tag the PACK FLOW IND (V12) circuit breaker:

(2) Open compartment door 118CR.

(3) Disconnect electrical cable connector from transducer receptacle and install protective caps.

(4) Remove bolts from transducer mounting plate.

(5) Remove transducer from duct and install protective plug in duct opening.

B. Installation

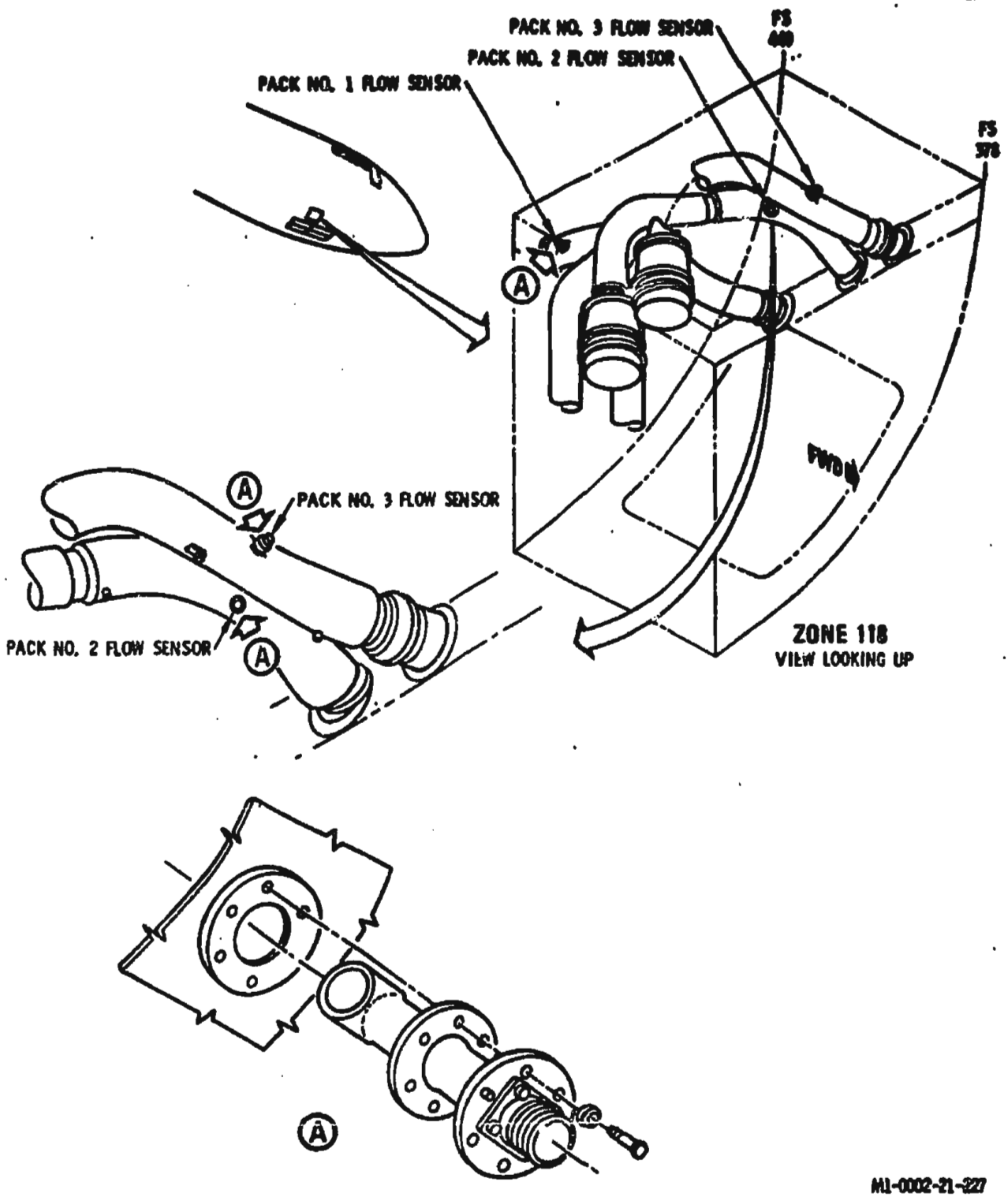
(1) Verify that circuit breaker opened in Step 3A(1) is open and tagged.

(2) Remove protective plug from duct. Insert transducer in hole in duct, rotate to align locator pin in unthreaded hole, and install bolts and washers (Ref. Fig. 401).

(3) Remove protective caps and connect cable connector to transducer receptacle.

(4) Close and secure compartment door 118CR.

(5) Remove tag and close circuit breaker panel in Step 3A(1).



Pack Flow Rate Transducer - Removal and Installation
Figure 401

PACK FLOW RATE TRANSDUCER - ADJUSTMENT AND TEST

1. General

R On aircraft with SB21-111,
R pack flow indicating system has been deactivated.

C There are three pack flow rate transducers, one for each system.
C Function of each pack flow rate transducer is to monitor the
C flow rate of one pack. Pack flow rate transducers are not
C adjustable while installed in the airplane. Any necessary
C adjustments or calibrations are performed in the shop. The
C following test procedure provides a go, no-go indication of
C operation in the aircraft. If the test results are
C unsatisfactory, the transducer must be removed and sent to the
C shop. One transducer is mounted in each of the water separator
C discharge ducts to the cold air plenum. No. 1 in left hand pack
C compartment and No. 2 and No. 3 in the right hand compartment.
C Functional test of each pack flow rate transducer is independent
C of the other two.

2. Adjustment/Test

A. Functional Test Pack No. 1

(1) Operate pack No. 1 from ground air or APU/Engine Bleed Air (Ref. 21-00-00).

NOTE: If APU is used, mode selector switch, on APU control panel, should be in NORM position.

(a) On ECS Monitor Panel, set Pack 1 AUTO/MAN to MAN and zone trim FLT STA, FWD CAB, MID CAB, AFT CAB and GALLEY to close.

On ECS Monitor Panel set PACK SELECT switch to 1 and ECS monitor selection switch to ACM DISCH.

(b) By using Pack 1 COOL and WARM switches, adjust ACM DISCH temp to 10°C if ground air is used and 50°C if bleed air is used. Record pack 1 flow rate on PACK FLOW indicator.

(c) On ECS MONITOR panel set ECS monitor selection switch to PACK INLET and record pack inlet temperature reading on ECS.

(d) On Figure 501 find the intersection of PACK FLOW reading recorded in Step (b) above and PACK INLET

temperature recorded in Step (c) above, and it should fall in the shaded area.

B. Functional Test Pack No. 2

(1) Operate pack No. 2 from ground air or APU/Engine Bleed Air (Ref. 21-00-00).

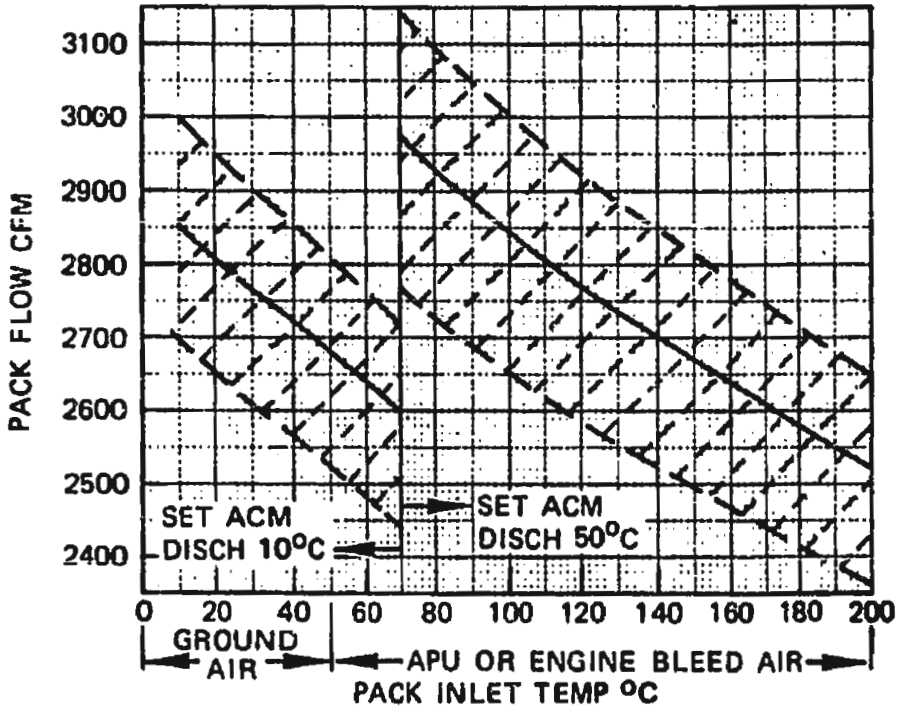
NOTE: If APU is used, mode selector switch, on APU control panel, should be in NORM position.

(a) On ECS Monitor Panel, set Pack 2 AUTO/MAN to MAN and zone trim FLT STA, FWD CAB, MID CAB, AFT CAB and GALLEY to close.

On ECS Monitor Panel set PACK SELECT switch to 2 and ECS monitor selection switch to ACM DISCH.

(b) By using Pack 2 COOL and WARM switches, adjust ACM DISCH temp to 10°C if ground air is used and 50°C if bleed air is used. Record pack 2 flow rate on PACK FLOW indicator.

(c) On ECS MONITOR panel set ECS monitor selection switch to PACK INLET and record pack inlet temperature reading on ECS.



NOTE

1 OPERATE ONE ECS PACK AT A TIME DURING CALIBRATION

2 CLOSE ZONE TRIMS

3 OPERATE IN MANUAL MODE

4 SET ACM DISCH AS SHOWN (DEPENDING ON PACK INLET) BY MANUAL PACK OPERATION

M1-0100-21-231

Pack Flow Indication System Calibration
Figure 501

(d) On Figure 501 find the intersection of PACK FLOW reading recorded in Step (b) above and PACK INLET temperature recorded in Step (c) above, and it should fall in the shaded area.

C. Functional Test Pack No. 3

(1) Operate pack No. 3 from ground air or APU/Engine Bleed Air (Ref. 21-00-00).

NOTE: If APU is used, mode selector switch, on APU control panel, should be in NORM position.

(a) On ECS Monitor Panel, set Pack 3 AUTO/MAN to MAN and zone trim FLT STA FWD CAB, MID CAB, AFT CAB and GALLEY to close.

On ECS Monitor Panel set PACK SELECT switch to 3 and ECS monitor selection switch to ACM DISCH.

(b) By using Pack 3 COOL and WARM switches, adjust ACM DISCH temp to 10°C if ground air is used and 50°C if bleed air is used. Record pack 3 flow rate on PACK FLOW indicator.

(c) On ECS MONITOR panel set ECS monitor selection switch to PACK INLET and record pack inlet temperature reading on ECS.

(d) On Figure 501 find the intersection of PACK FLOW reading recorded in Step (b) above and Pack INLET temperature recorded in Step (c) above, and it should fall in the shaded area.

PACK FLOW RATE SIGNAL CONDITIONER/AMPLIFIER REMOVAL AND INSTALLATION

1. General

R On aircraft with SB21-111,
R pack flow indicating system has been deactivated.

The pack flow rate signal conditioner/amplifier is located on the Flight Engineer/Second Officers upper panel, zone 215, environmental control system (ECS) MONITOR panel. Access is gained by loosening the integrated pneumatic system (IPS) panel fasteners and sliding the panel outward. The signal conditioner is mounted on the left side of the IPS panel frame structure (Ref. Fig. 401).

2. Equipment and Materials

Protective caps

3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officer circuit breaker panel CB3, zone 215, open and tag the PACK FLOW IND (V12) circuit breaker.

(2) Loosen fasteners on face of ECS MONITOR panel and slide panel out to limit stops.

(3) Remove electrical cable connector from signal conditioner receptacle and install protective caps.

(4) Remove nuts and bolts attaching signal conditioner to frame.

(5) Remove signal conditioner from panel frame.

B. Installation

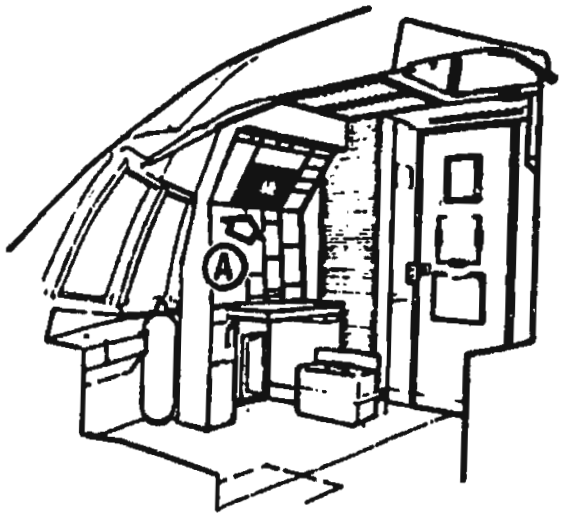
(1) Verify that circuit breakers opened in Step 3A(1) are open and tagged.

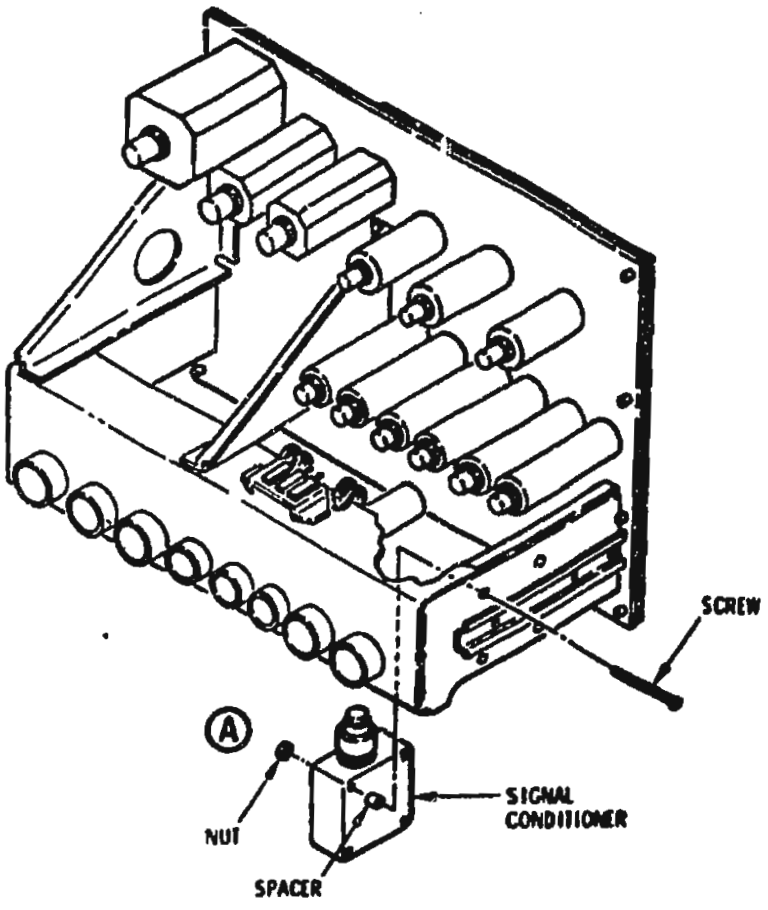
(2) Position signal conditioner to attaching frame and install nuts and bolts.

(3) Remove protective cap from electrical connector and connect electrical connector to signal conditioner receptacle.

(4) Slide ECS MONITOR panel back into panel rack and secure to rack frame.

(5) Remove tags and close circuit breakers opened in Step 3A(1).





MM 8BM
A11-0100-21-230

R Pack Flow Rate Signal Conditioner/Amplifier
R Removal and Installation
R Figure 401

EFFECTIVITY: ALL

B

PACK FLOW SIGNAL CONDITIONER/AMPLIFIER ADJUSTMENT AND TEST

1. General

R On aircraft with SB21-111,
R pack flow indicating system has been deactivated.

Operation of the pack flow signal conditioner is observed on the ECS MONITOR panel, PACK FLOW-CFM indicator on the Flight Engineer/Second Officer upper instrument panel, zone 215. The pack flow signal conditioner supplies signals to the Aircraft Integrated Data System in addition to the ECS Monitor.

No adjustment is made for the pack flow signal conditioner in the aircraft.

2. Referenced Procedures

21-00-00	Air Conditioning - Maintenance Practices
21-60-00	Temperature Control - Maintenance Practices
24-00-00	Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Operational Test - Using One Pack at a Time

(1) Operate selected pack from ground air, APU, or engine bleed air.

(2) On CABIN TEMP CONTROL panel, set selected pack AUTO/MNL to MNL.

(3) On CABIN TEMP control panel, set Zone Trims FLT STA, FWD CAB, MID CAB, AFT CAB and GALLEY to CLOSE.

(4) On ECS MONITOR panel set PACK SELECT to the air conditioning pack being used in Step (1) above.

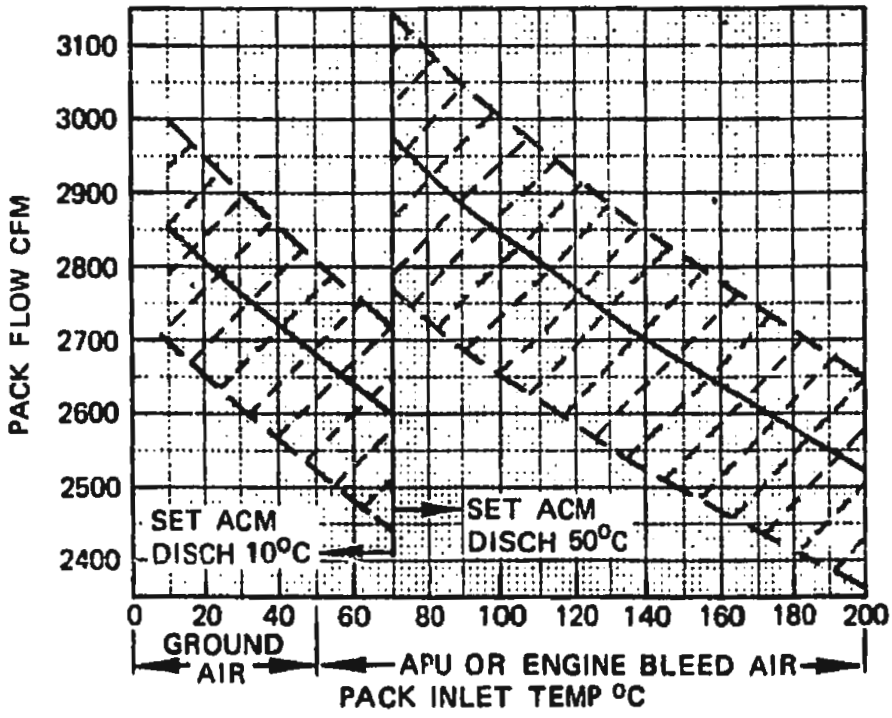
(5) On ECS MONITOR panel set ECS-TEMP selector to ACM DISCH.

(6) Using COOL and WARM switches for selected pack, adjust ACM DISCH-TEMP to 10°C if ground air is used and 50°C if bleed air is used. Observe and record PACK FLOW-CFM indication.

(7) On ECS MONITOR panel, set ECS-TEMP selector to PACK INLET. Observe and record ECS-TEMP (PACK INLET) indication.

(8) In Figure 501, find intersection of PACK FLOW-CFM indication recorded in Step (6) above and ECS-TEMP (PACK INLET) indication recorded in Step (7) above. The intersection should fall within the shaded area.

R (9) Repeat Steps (1) through (8) for each of the other two
R air conditioning packs.



Pack Flow and Inlet Temperature Chart
Figure 501

R ECS TEMPERATURE INDICATOR - REMOVAL AND INSTALLATION

R 1. General

R ECS temperature indicator monitors the pack and hot air duct
R temperatures of each of the three packs. It is mounted in the
R Flight Engineer/Second Officers ECS MONITOR panel.

R 2. Removal/Installation

R A. Removal

R (1) On Flight Engineer/Second Officer aft circuit breaker
R panel CB3, open and tag BLEED AIR IND R17.

R (2) Locate ECS TEMP indicator on FE/SO ECS MONITOR panel.

R (3) Loosen roundhead clamp screw securing ECS TEMP
R indicator to ECS MONITOR panel.

R (4) Pull ECS TEMP indicator out of recess in ECS MONITOR
R panel and disconnect connector from receptacle.

R B. Installation

R (1) Verify that circuit breaker opened in Step 2A(1) is
R open and tagged.

R (2) Reconnect connector to receptacle.

R (3) Place ECS TEMP indicator into recess in ECS MONITOR
R panel, slide into position, and secure by tightening
R clamp screw.

R (4) Remove tags and close circuit breaker opened in Step
R 2A(1).

R (5) Check temperature of any one of the five ECS switch
R positions and verify it is indicating the ambient
R temperature.

R HOT AIR MANIFOLD TEMPERATURE SENSORS - REMOVAL AND INSTALLATION

R 1. General

R The two hot air manifold temperature sensors are installed in
R the right Environmental Control System (ECS) compartment, zone
R 118, and are located at the bleed air and hot manifold ducts
R (Ref. Figure 401).

R 2. Equipment and Materials

R Temperature Sensors

R Packing

R Lockwire, Type S QQ-W-343D or equivalent

R Lockwire, Inconel QQ-W-390B or equivalent

R 3. Referenced Procedures

R 06-40-00 Exterior Access Door and Panels Zone 100

R 20-00-06 Safetying Practices

R 24-00-00 Electrical Power System - Description and Operation

R 20-00-07 Wiring Manual

R 4. Removal

R A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED
R AIR AND APU CONTROL PANELS AND THE THREE
R HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT
R SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

R RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL
R REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH
R SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE
R USED WHEN REQUIRED.

R (1) On Flight Engineer/Second Officers aft circuit breaker
R panel CB3, zone 215, open and tag the following circuit
R breakers:

R PACK 1 - AUTO/MAN - DC (V5) and AC (V6)

R PACK 2 - AUTO/MAN - DC (V7) and AC (V8)

R PACK 3 - AUTO/MAN - DC (V17) and AC (V18)

R HOT AIR MANIF - IND - W5

R ECS AIR TEMP IND - V1

R (2) Open right ECS compartment door 118CR (Ref. 6-40-00).

R (3) Disconnect electrical plugs from Hot Air Manifold
R Temperature Sensors and install protective caps on plug
R and sensors (Ref. Figure 401).

R (4) Remove Hot Air Manifold Temperature Sensor from duct at
R FS390/FS380 and install protective plug in duct
R opening.

R B. Installation

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO
R BLEED AIR AND APU CONTROL PANELS AND THE THREE
R HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

R (1) Verify that circuit breakers opened in Step 4A(1) are
R opened and tagged.

R (2) Remove protective plug from duct opening, install
R packing on sensor and install sensor in duct (Ref.
R Figure 401).

R (3) Torque sensor to 40-50 inch pounds and safety using
R 0.032 inch diameter Inconel QQ-W-390B lockwire (Ref.
R 20-00-06).

R (4) Install electrical plug on temperature sensor and
R safety connector using 0.020 inch diameter QQ-W-343D
R Type S lockwire (Ref. 20-00-06).

R (5) Dress and tie all harnesses affected (Ref. WM
R 20-00-07).

R (6) Remove tags and close circuit breakers opened in Step
R 4A(1).

R (7) Turn on electrical power (Ref. 24-00-00).

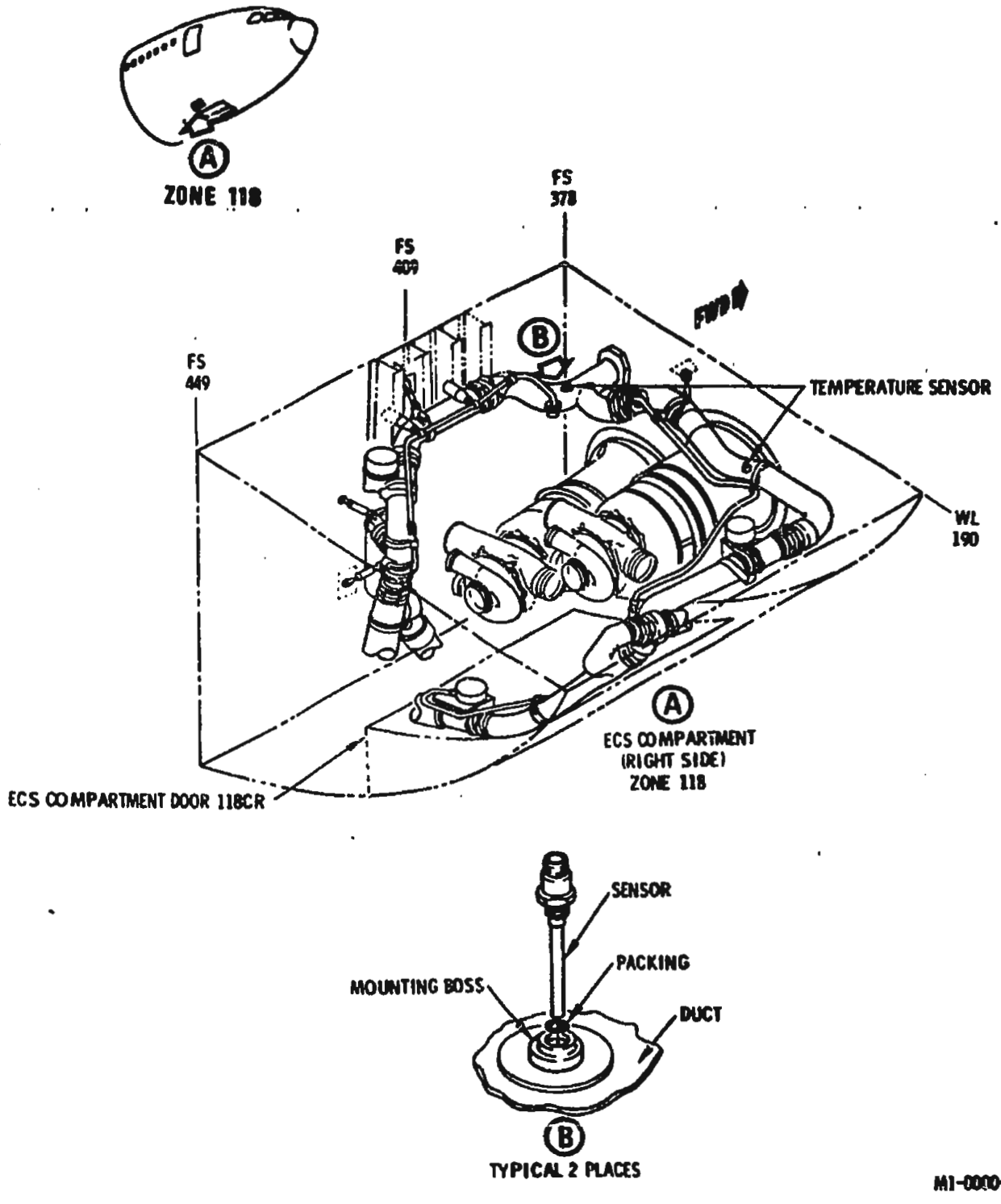
R (8) On Flight Engineer/Second Officers ECS MONITOR panel,
R zone 215, select HOT MANF and read ECS TEMP indicator

R for PACK SELECT selector positions 2 and 3. All
R positions must read the same within ±3 degrees.

R (9) Turn off electrical power (Ref. 24-00-00).

R (10) Close and secure right ECS compartment door opened in
R step 4.A.(2).

R (11) Remove tags installed at beginning of paragraph 4.



R Hot Air Manifold Temperature Sensors
R Figure 401

PACK INLET TEMPERATURE SENSORS - REMOVAL AND INSTALLATION

1. General

The pack inlet temperature sensors are located in the crossbleed manifold, zone 142, at the points where the environmental control system ducts start forward to the pack flow control valves. Removal and installation procedures are identical for each sensor.

2. Equipment and Materials

Protective caps and plug

Port seal, Technical Industries Inc, Harrison Mfg Co. Division, PN 20202CL4, or equivalent

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

R (1) On the Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker BLEED - AIR - IND (R17).

(2) Open access panel 142DB (bottom centerline of fuselage at FS 1000).

(3) Remove electrical connector from applicable sensor (Ref. Fig. 401). Install protective caps on plug and sensor.

(4) Remove sensor from mounting boss. Install protective plug in boss.

(5) Remove and discard port seal from sensor.

B. Installation

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

R (2) Install new port seal on sensor.

R (3) Remove protective plug from mounting boss and install
R sensor. Torque sensor 40 to 50 lb in. and lock-wire.

R (4) Remove protective caps and install electrical
R connector.

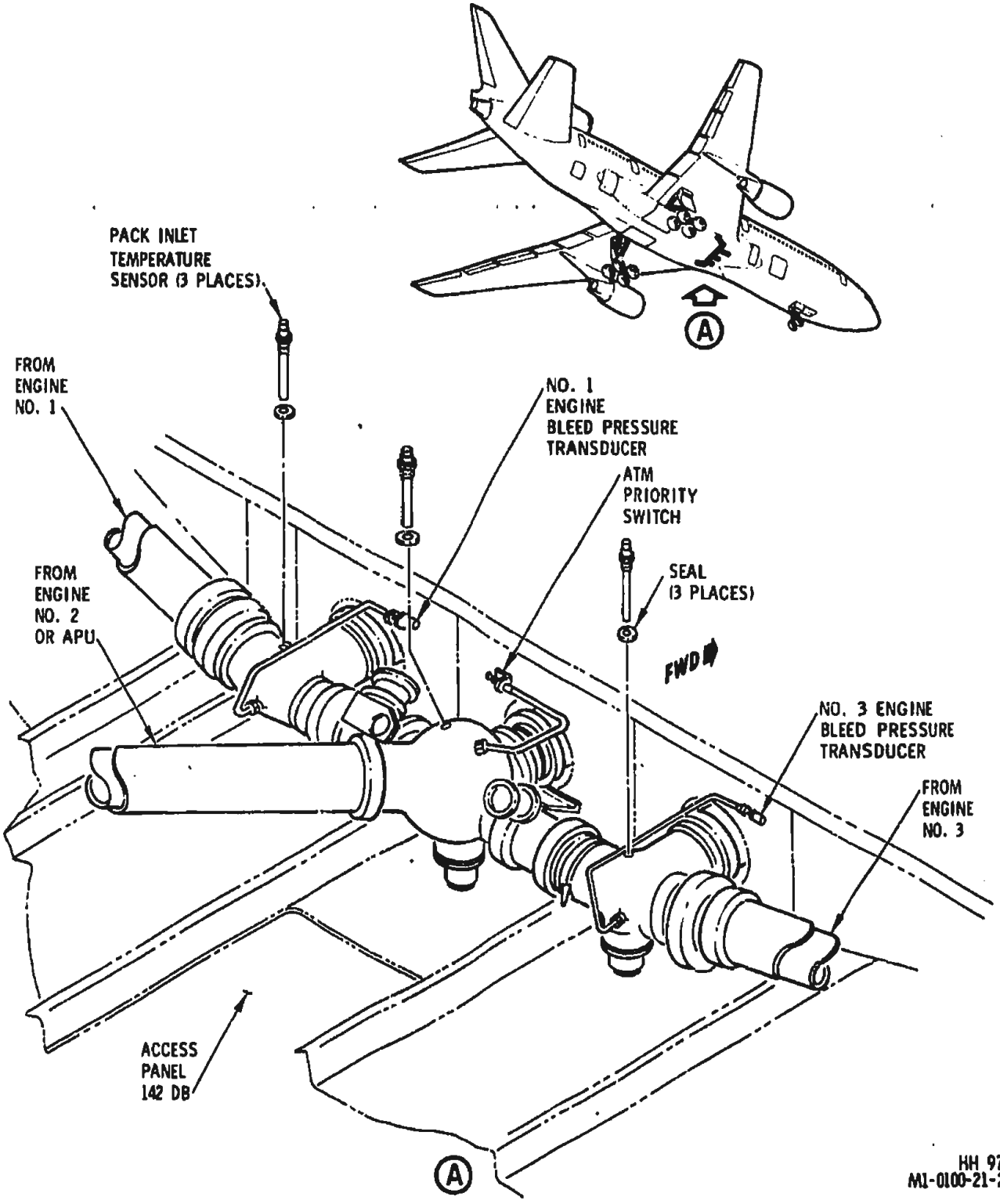
R (5) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (6) Turn on electrical power (Ref. 24-00-00).

R (7) On the Flight Engineer/Second Officers ECS MONITOR
R panel, zone 215, select PACK INLET and read ECS TEMP
R indicator for PACK SELECT selector positions 1, 2, and
R 3. All positions must read the same within ±3 degrees.

R (8) Turn off electrical power (Ref. 24-00-00).

R (9) Reinstall access panel.



R Pack Inlet Temperature Sensors - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

PACK COMPRESSOR DISCHARGE TEMPERATURE SENSORS REMOVAL AND INSTALLATION

1. General

There are three pack compressor discharge temperature sensors (one for each pack)(Ref. Fig. 401). Each sensor is located in the duct between the air cycle machine compressor outlet and the heat exchanger. The pack No. 1 sensor is in the left environmental control system (ECS) compartment, zone 117. The pack No. 2 and No. 3 sensors are in the right ECS compartment, zone 118. Access is through ECS compartment doors 117AL and 118CR. The removal and installation procedure for all sensors is identical.

2. Equipment and Materials

Protective caps and plugs

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V-1).

(2) Open applicable ECS compartment access door.

(3) Remove electrical connector from sensor and install protective caps on plug and sensor.

(4) Remove sensor from duct and install protective plug in duct opening.

B. Installation

R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO
R BLEED AIR AND APU CONTROL PANELS AND THE THREE
R HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective plug from duct opening and install sensor.

(3) Remove protective caps and connect electrical connector to sensor.

(4) Remove tag and close circuit breaker opened in Step 4A(1).

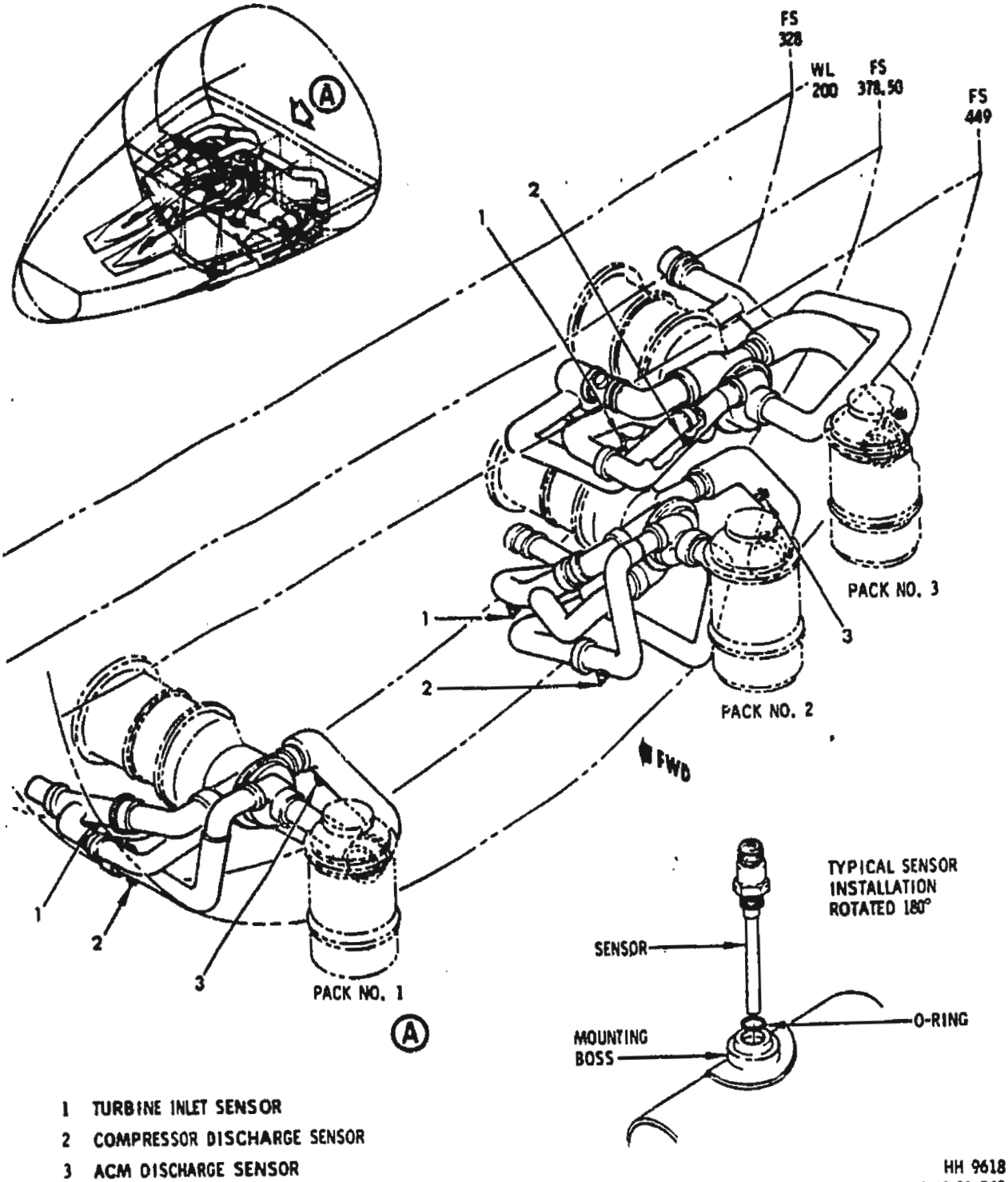
(5) Turn on electrical power (Ref. 24-00-00).

(6) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, select CPRSR DISCH and read ECS TEMP indicator for PACK SELECT selector positions 1, 2 and 3. All positions must read the same within ±3 degrees.

(7) Turn off electrical power (Ref. 24-00-00).

(8) Close and secure access door.

(9) Remove tags installed at beginning of Paragraph 4.



1 TURBINE INLET SENSOR
2 COMPRESSOR DISCHARGE SENSOR
3 ACM DISCHARGE SENSOR

HH 9618
M1-0100-21-245

R R R **Pack Compressor Discharge Temperature Sensors Removal and Installation Figure 401**

TURBINE INLET TEMPERATURE SENSORS - REMOVAL AND INSTALLATION

1. General

There are three turbine inlet temperature sensors (one for each pack)(Ref. Fig. 401). Each sensor is located in the duct between the heat exchanger and the air cycle machine turbine inlet. The pack No. 1 sensor is in the left environmental control system (ECS) compartment, zone 117. The pack No. 2 and No. 3 sensors are in the right ECS compartment, zone 118.
R Access is through the ECS compartment doors 117AL and 118CR. The removal and installation procedure for all sensors is identical.

2. Equipment and Materials

Protective caps and plugs

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNEUMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V-1).

(2) Open applicable ECS compartment access door.

(3) Remove electrical connector from sensor and install protective caps on plug and sensor.

(4) Remove sensor from duct and install protective plug in duct opening.

B. Installation

R R R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective plug from duct opening and install sensor.

(3) Remove protective caps and connect electrical connector to sensor.

(4) Remove tag and close circuit breaker opened in Step 4A(1).

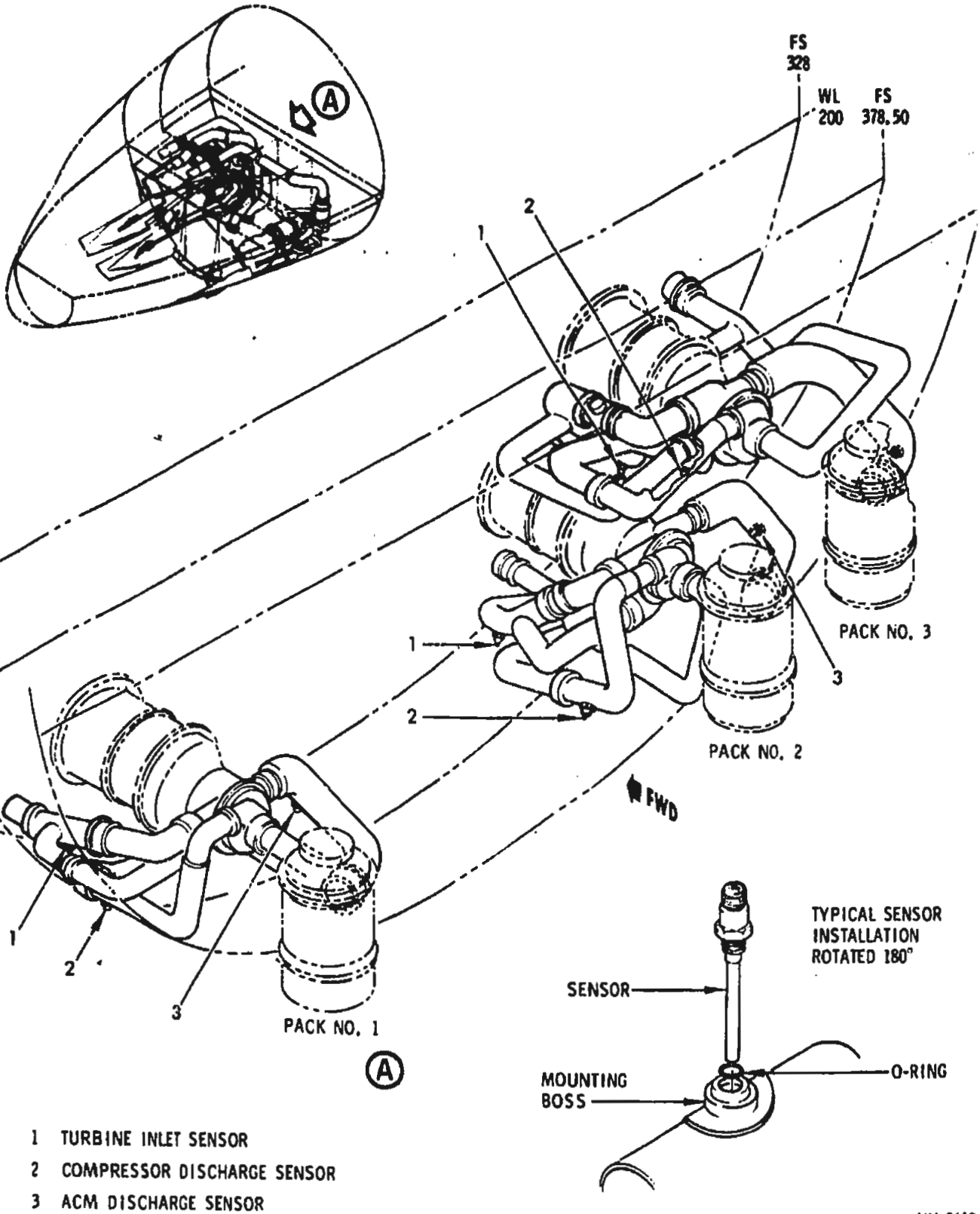
(5) Turn on electrical power (Ref. 24-00-00).

(6) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, select TURB INLET and read ECS TEMP indicator for PACK SELECT selector positions 1, 2, and 3. All positions must read the same within ±3 degrees.

(7) Turn off electrical power (Ref. 24-00-00).

(8) Close and secure access door.

(9) Remove tags installed at beginning of Paragraph 4.



R Turbine Inlet Temperature Sensors - Removal and Installation
R Figure 401

R EFFECTIVITY: ALL

050

AIR CYCLE MACHINE DISCHARGE TEMPERATURE SENSORS REMOVAL AND INSTALLATION

1. General

There are three air cycle machine (ACM) discharge temperature sensors (one for each pack) (Ref. Fig. 401). Each sensor is located in the duct between the ACM discharge and the water separator. The pack No. 1 sensor is in the left environmental control system (ECS) compartment, zone 117. The pack No. 2 and No. 3 sensors are in the right ECS compartment, zone 118.
R Access is through ECS compartment doors 117AL and 118CR. The removal and installation procedure for all sensors is identical.

2. Equipment and Materials

Protective caps and plugs

3. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

4. Removal/Installation

A. Removal

R WARNING: TAG FLIGHT ENGINEER/SECOND OFFICERS (FE/SO) BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS TO PREVENT SYSTEM OPERATION UNTIL COMPLETION OF PROCEDURES.

RECENT OPERATION OF AIRCRAFT PNUEMATIC SYSTEM WILL REQUIRE PRECAUTIONS AGAINST DANGEROUSLY HIGH SYSTEM TEMPERATURES. PROTECTIVE GLOVES SHOULD BE USED WHEN REQUIRED.

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V-1).

(2) Open applicable ECS compartment access door.

(3) Remove electrical connector from sensor and install protective caps on plug and sensor.

(4) Remove sensor from duct and install protective plug in duct opening.

B. Installation

R R R WARNING: VERIFY THAT TAGS PREVIOUSLY INSTALLED ON FE/SO BLEED AIR AND APU CONTROL PANELS AND THE THREE HIGH-PRESSURE GROUND AIR CONNECTIONS ARE IN PLACE.

(1) Verify that circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective plug from duct opening and install sensor.

(3) Remove protective caps and connect electrical connector to sensor.

(4) Remove tag and close circuit breaker opened in Step 4A(1).

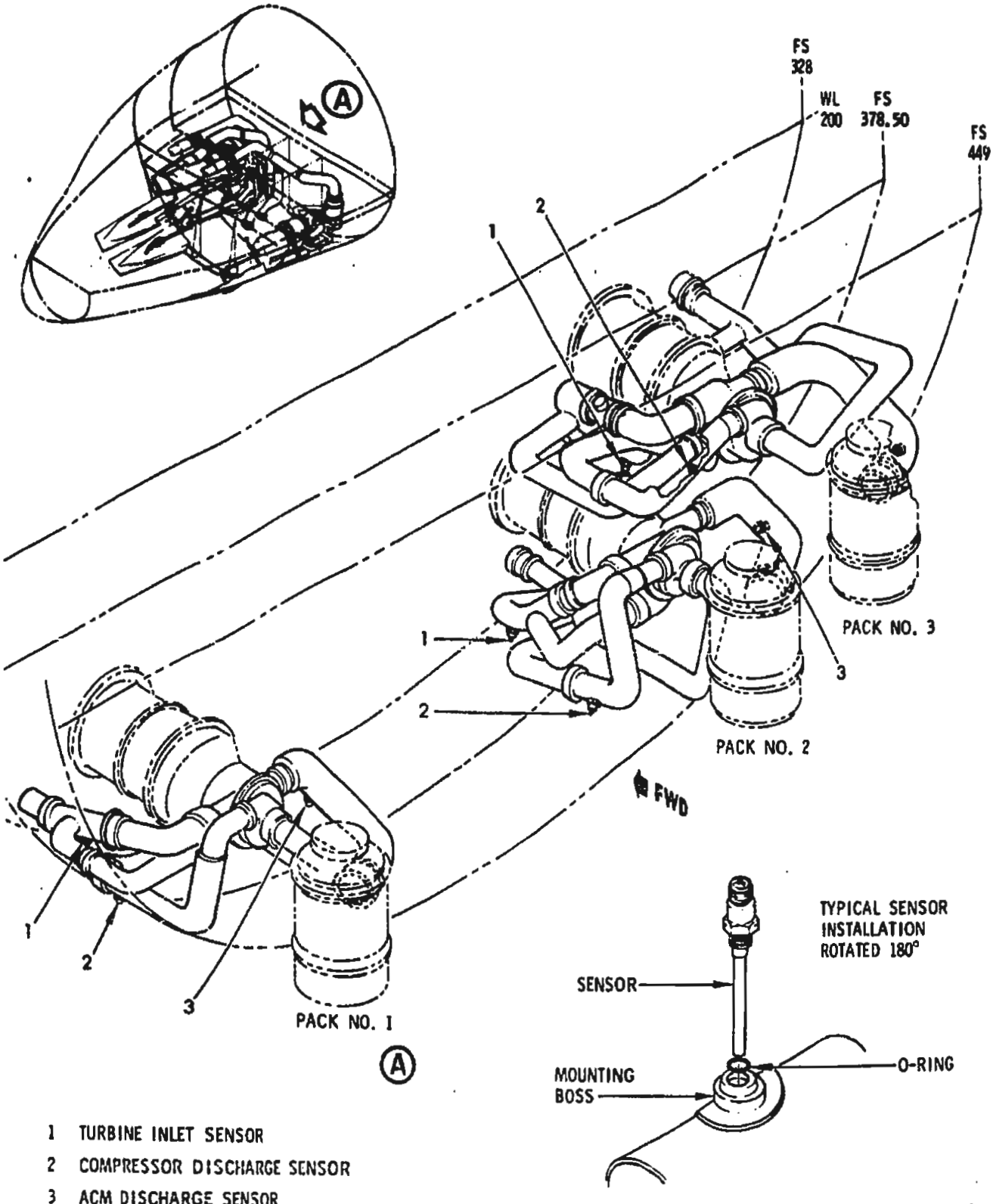
(5) Turn on electrical power (Ref. 24-00-00).

(6) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, select ACM DISCH and read ECS TEMP indicator for PACK SELECT selector positions 1, 2, and 3. All positions must read the same within ±3 degrees.

(7) Turn off electrical power (Ref. 24-00-00).

(8) Close and secure access door.

(9) Remove tags installed at beginning of Paragraph 4.



1 TURBINE INLET SENSOR
2 COMPRESSOR DISCHARGE SENSOR
3 ACM DISCHARGE SENSOR

HH 9618
M1-0100-21-245

R Air Cycle Machine Discharge Temperature Sensors
R Removal and Installation
R Figure 401

R EFFECTIVITY: ALL

050

CABIN TEMPERATURE INDICATOR - REMOVAL AND INSTALLATION

1. General

Cabin temperature indicator monitors the cabin zone or cabin supply duct temperatures of each of the five (Flight Station, Fwd Cabin, Mid Cabin, Aft Cabin and Galley) zones. It is
R mounted in the Flight Engineer/Second Officers (FE/SO) ECS MONITOR panel.

2. Removal/Installation

A. Removal

R (1) On FE/SO aft circuit breaker panel CB3, open and tag circuit breaker ECS AIR TEMP IND (V1).

(2) Locate CABIN TEMP indicator on FE/SO ECS MONITOR panel.

(3) Loosen round head clamp screw securing CABIN TEMP indicator to ECS MONITOR panel.

(4) Pull CABIN TEMP indicator out of recess in ECS MONITOR panel and disconnect connector from receptacle.

B. Installation

(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

(2) Reconnect connector to receptacle.

(3) Place CABIN TEMP indicator into recess in ECS MONITOR panel, slide into position, and secure by tightening clamp screw.

(4) Remove tags and close circuit breaker opened in Step 2A(1).

(5) Check temperature of each of the five (Flight Station, Fwd Cabin, Mid Cabin, Aft Cabin and Galley) zones and verify it is indicating the ambient temperature of each zone.

FLIGHT STATION ZONE TEMPERATURE INDICATION SENSOR REMOVAL AND INSTALLATION

1. General

The flight station zone temperature sensor (indication) is mounted on the forward side of the flight station/cabin bulkhead, above the left corner of the flight station entry door.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Scond Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag the following circuit breaker:

ECS - AIR TEMP - IND (V1).

(2) In flight station, above left corner of flight station entry door, remove screws and washers securing cover over temperature sensor electrical connector and remove cover.

(3) Disconnect electrical cable connector from sensor receptacle and install protective caps on cable connector and sensor receptacle.

(4) Note position of grounding clip on sensor, remove nut and washer securing sensor to bracket, and remove sensor from bracket and grounding clip.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Insert sensor through grounding clip and hole in mounting bracket and position grounding clip as noted in Step 4A(4).

(3) Rotate sensor until electrical receptacle master keyway points up and aft at approximately 45 degrees, then install washer and nut securing sensor to bracket.

(4) Remove protective caps and connect electrical cable connector to sensor receptacle.

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Turn on electrical power (Ref. 24-00-00).

R (7) On FE/SO ECS MONITOR panel, zone 215, rotate CABIN temperature indicator selector switch to FLT STA position.

(8) Release TEMP SELECT switchlight to ZONE (out) position. ZONE legend in switchlight must come on.

(9) Observe CABIN TEMP indicator. Verify that temperature indicated is ambient temperature at the flight station sensor.

(10) Install cover over sensor electrical connector, using screws and washers retained from removal.

(11) Turn off electrical power (Ref. 24-00-00).

FLIGHT STATION ZONE TEMPERATURE INDICATION SENSOR REMOVAL AND INSTALLATION

1. General

R The flight station zone temperature sensors for temperature control (Ref. 21-61-17) and temperature monitor indication are mounted together in the instrument cooling fan inlet duct under the Flight Engineer/Second Officers table.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag the following circuit breaker:

ECS - AIR TEMP - IND (V1)

On overhead circuit breaker panel CB2, zone 215, open and tag the following circuit breaker:

INSTR - COOLING (A21).

R (2) On FE/SO instrument panel placard DO NOT OPERATE
R FORWARD ELECTRONICS SERVICE CENTER EQUIPMENT OR TURN ON
R AIRCRAFT ELECTRICAL GROUND SERVICE SYSTEM until this
R procedure is completed.

R (3) Remove instrument cooling fan inlet cover panel (inlet
R grille) and screen from the FE/SO kickshield (under
R FE/SO work table).

(4) Disconnect electrical cable connector from sensor receptacle (aft sensor) and install protective caps on cable connector and sensor receptacle.

(5) Unscrew sensor from mounting boss and pull sensor straight out of mounting boss.

B. Installation

(1) Verify circuit breakers opened in Step 4A(1) are open and tagged.

(2) Install flight station zone temperature sensor in mounting boss in instrument cooling fan inlet duct.

(3) Remove protective caps and connect electrical cable connector to sensor receptacle.

(4) Remove tag and close circuit breakers opened in Step 4A(1).

(5) Remove placard installed in Step 4A(2).

(6) Turn on electrical power (Ref. 24-00-00).

R (7) On FE/SO ECS MONITOR panel, zone 215, rotate CABIN temperature indicator selector switch to FLT STA position.

(8) Release TEMP SELECT switchlight to ZONE (out) position. ZONE legend in switchlight must come on.

(9) Observe CABIN TEMP indicator. Verify that temperature indicated is ambient temperature at the flight station sensor.

(10) Install instrument cooling fan inlet cover panel (inlet
R grille) and screen removed in Step 4A(3).

(11) Turn off electrical power (Ref. 24-00-00).

ZONE TEMPERATURE INDICATION SENSORS - CLEANING AND PAINTING

1. General

Cleaning procedures for the five zones (Flight Station, Fwd Cabin, Mid Cabin, Aft Cabin and Galley) temperature sensors are the same except for removal and installation procedures.

2. Equipment and Materials

R Isopropyl alcohol

R Soft clean cloth or cotton swab

R Small cloth bag

3. Referenced Procedures

21-63-30 Flight Station zone Temperature Indication Sensor - Removal and Installation

21-63-31 Cabin Zone Temperature Indication Sensors - Removal and Installation

21-63-34 Galley Zone Temperature Indication Sensor - Removal and Installation

4. Cleaning/Painting

R A. Cleaning

(1) Remove zone temperature sensor (Ref. 21-63-30, 21-63-31 or 21-63-34 as applicable).

R WARNING: USE ALCOHOL IN WELL-VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN.
R PROLONGED EXPOSURE MAY RESULT IN DIZZINESS OR
R RESPIRATORY SYSTEM, SKIN, OR EYE IRRIATION.

R KEEP ALCOHOL AWAY FROM HEAT, SPARKS, AND OPEN
R FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

(2) Clean sensor and electrical connector very gently using clean rag or cotton swab moistened with isopropyl alcohol, as required.

(3) Inspect sensor externally for damage. A damaged sensor must be replaced.

(4) Lower PSU located above sensor box.

(5) Remove jet pump hose from back of sensor air collector box.

(6) Place a small cloth bag over collector box outlet duct.

(7) Blow low pressure air through the collector box, catching lint and debris in cloth bag.

(8) Using low pressure air and suitable hand tool, remove lint and debris from perforated grille.

R (9) Reinstall jet pump hose removed in Step 4A(5).

(10) Reinstall cabin zone temperature sensor assembly (Ref. 21-63-30, 21-63-31 or 21-63-34 as applicable).

(11) With three air conditioning systems operating, assure that exhaust flow is established through the sensor assembly.

R B. Painting

R NOTE: No painting is required.

CABIN ZONE TEMPERATURE INDICATION SENSORS - REMOVAL AND INSTALLATION

1. General

There are three cabin zone temperature sensors for temperature control (Ref. 21-61-18) and three for temperature monitor indication. One of each type sensor is mounted in a mounting assembly in each cabin zone. The monitoring assemblies are installed in the lower inboard edge of the right hand outboard overhead stowage modules.

Sensor mounting assemblies are located as follows:

Forward cabin: FS 565, above the ninth window aft of the right front passenger (R1) door.

Mid cabin: FS 1020, above the fifth window aft of the right mid passenger (R2) door.

Aft cabin: FS 1580, above the second window aft of the right aft passenger (R3) door.

Jet pump assemblies, using air from the individual air outlet system in each cabin zone, provide cabin exhaust air flow across the sensors in each assembly.

Removal and Installation procedures are the same for all three sensors, except for sensor locations.

R 2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

Protective caps

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft (FE/SO) circuit breaker panel CB3, zone 215, open and tag the following circuit breaker: ECS - AIR TEMP - IND (V1).

(2) Open overhead stowage compartment door above sensor mounting assembly:

Forward cabin: above ninth window aft of right front passenger (R1) door.

Mid cabin: above fifth window aft of right mid passenger (R2) door.

Aft cabin: above second window aft of right aft passenger (R3) door.

(3) Remove screws and washers securing perforated pan in mounting assembly.

(4) Gently lower perforated pan, containing sensors, just enough for access to sensor.

(5) Disconnect electrical cable connector from smaller of two sensors in perforated pan and install protective caps on cable connector and sensor receptacle.

(6) Remove nut and washers securing small sensor in bracket and remove sensor.

(7) If new sensor is not immediately available for installation, secure perforated pan and sensor assembly to prevent weight of assembly from hanging on electrical wiring.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Install one washer on sensor, insert sensor into mounting bracket in perforated pan and sensor assembly, then install second washer and nut.

(3) Remove protective caps and connect electrical cable connector to sensor receptacle.

(4) Remove tag and close circuit breaker opened in Step 4A(1).

(5) Turn on electrical power (Ref. 24-00-00).

R (6) On FE/SO ECS MONITOR panel, zone 215, rotate CABIN temperature indicator selector switch to applicable position; FWD CAB, MID CAB, or AFT CAB.

(7) Release TEMP SELECT switchlight to ZONE (out) position. ZONE legend in switchlight must come on.

R R R (8) Observe CABIN TEMP indicator. Verify that temperature indicated is ambient temperature at the applicable sensor.

R R (9) Install perforated pan in mounting assembly, using screws and washers retained from removal.

R R (10) Close stowage compartment door above sensor mounting assembly.

R (11) Turn off electrical power (Ref. 24-00-00).

GALLEY ZONE TEMPERATURE INDICATION SENSOR - REMOVAL AND INSTALLATION

1. General

The galley zone temperature sensors for temperature control (Ref. 21-61-21) and temperature monitor indication are mounted together in a mounting assembly right of PA speaker at the galley FWD bulkhead.

R 2. Equipment and Materials

Protective cap

R 3. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V1).

R (2) At galley forward bulkhead, right of PA speaker, remove cover from side of mounting assembly and disconnect electrical cable connector from galley zone temperature indication sensor (forward sensor in mounting assembly, Ref. Fig. 401).

(3) Install protective caps on cable connector and sensor receptacle and stow cable to prevent damage.

(4) On aircraft 001-031 without SB21-114, unscrew sensor from mounting boss and pull sensor straight out of mounting assembly.

R (4) On aircraft 001-031 with SB21-114 and 032-999,
R remove temperature sensor protective cover, unscrew sensor from mounting boss and pull sensor straight out of mounting assembly.

B. Installation

R (1) Verify circuit breaker opened in Step 3A(1) is open and
R tagged.

(2) On aircraft 001-031 without SB21-114, install galley zone temperature sensor in mounting boss of mounting assembly.

R (2) On aircraft 001-031 with SB21-114 and 032-999, install galley zone temperature sensor in mounting boss of mounting assembly and install temperature sensor protective cover over the sensors.

(3) Remove protective cap and connect electrical cable connector to sensor receptacle.

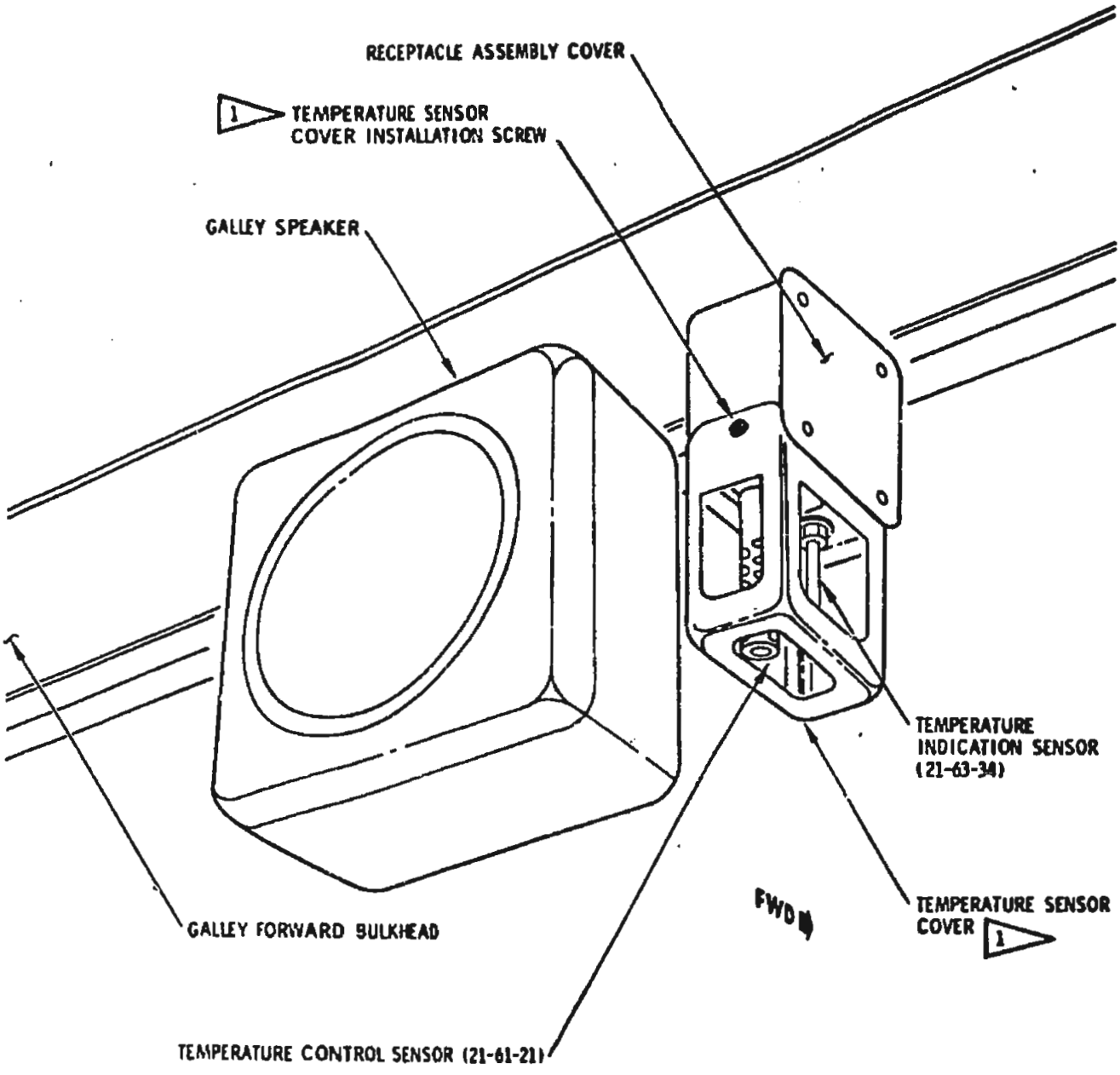
(4) Install mounting assembly cover.

R (5) Remove tag and close circuit breaker opened in Step
R 3A(1).

R (6) On FE/SO ECS MONITOR panel, zone 215, rotate CABIN
R temperature indicator selector switch to GALLEY.

R (7) Release TEMP SELECT switchlight to ZONE (out) position
R and verify ZONE light comes on.

R (8) Observe CABIN TEMP indicator and verify that
R temperature indicated at galley sensor is ambient
R temperature.



NOTE:

1 ON AIRCRAFT WITH SB21-114

M1-0001-21-244

R Galley Zone Temperature Indication Sensor - Removal and Installation
R Figure 401

R

FLIGHT STATION DUCT TEMPERATURE INDICATION SENSOR REMOVAL AND INSTALLATION

1. General

The flight station duct temperature sensors for temperature control (Ref. 21-61-12) and for temperature indication (this sensor) are mounted in adjacent bosses in the flight station supply air duct in the forward electronic service center (FESC) near the compartment ceiling. Access to the sensors is through FESC access door 112AB, with the sensors in the duct section crossing diagonally to the right of the compartment, at FS 264.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Equipment and Materials

O-ring, MS9385-05, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec QQ-W-390 Cond A, or equivalent

Protective caps and plug

4. Removal/Installation

A. Removal

(1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS AIR TEMP IND (V1).

(2) Open FESC access door 112AB.

(3) In FESC overhead (FS 264 and RBL 35), disconnect electrical cable connector from hexagonal screw-in type sensor and install protective caps on connector and receptacle.

(4) Cut lockwire and remove sensor (unscrew) from mounting boss.

(5) Remove and discard O-ring.

R (6) If new sensor is not immediately available for
R installation, install protective plug in duct boss.

R B. Installation

R (1) Verify circuit breaker opened in Step 4A(1) is open and
R tagged.

R (2) Remove protective plug from duct boss and verify boss
R is clean and undamaged.

R (3) Install new O-ring on sensor and install and lock-wire
R sensor in duct boss.

R (4) Remove protective caps and connect and lock-wire
R electrical cable connector to sensor receptacle.

R (5) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (6) Turn on electrical power (Ref. 24-00-00).

R (7) On Flight Engineer/Second Officers ECS MONITOR panel,
R zone 215, rotate CABIN temperature indicator selector
R switch to FLT STA position.

R (8) Depress TEMP SELECT switchlight to DUCT (latched in)
R position. DUCT legend in switchlight must come on.

R (9) Observe CABIN TEMP indicator. Verify that temperature
R indicated is ambient temperature at the sensor.

R (10) Close FESC access door 112AB.

R (11) Turn off electrical power (Ref. 24-00-00).

CABIN DUCT TEMPERATURE INDICATION SENSOR - REMOVAL AND INSTALLATION

1. General

There are three cabin duct temperature sensors for temperature control (Ref. 21-61-13) and three for temperature indication (these sensors). One of each type sensor is mounted, in adjacent bosses, in the duct supplying air to each cabin zone.

All cabin duct temperature sensors are mounted in the three ducts above the forward cabin ceiling, with access through ceiling panels. The forward cabin sensors are in the center duct at FS 436, mid cabin sensors in the right hand duct at FS 543, and aft cabin sensors in the left hand duct at FS 543.

Removal and installation procedures are the same for all three sensors, except for sensor locations.

2. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
25-26-01	Forward, Mid, and Aft Ceiling Trim Drop Panels - Removal and Installation

3. Equipment and Materials

O-ring, MS9385-05, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec QQ-W-390 Cond A, or equivalent

Protective caps and plug

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V1).

(2) Open ceiling panel 233AB (Ref. 25-26-01).

(3) Locate applicable sensor:

Forward cabin: center duct at FS 436

Mid cabin: right hand duct at FS 543

Aft cabin: left hand duct at FS 543

(4) Disconnect electrical cable connector from receptacle of hexagonal screw-in type sensor and install protective caps on connector and receptacle.

(5) Remove sensor (unscrew) from mounting boss.

(6) Remove and discard O-ring.

(7) If new sensor is not immediately available for installation, install protective plug in duct boss.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective plug from duct boss and verify boss is clean and undamaged.

(3) Install new O-ring on sensor and install and lock-wire sensor in duct boss.

(4) Remove protective caps and connect and lock-wire electrical cable connector to sensor receptacle.

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Turn on electrical power (Ref. 24-00-00).

(7) On Flight Engineer/Second Officers ECS MONITOR panel, zone 215, rotate CABIN temperature indicator selector switch to applicable position; FWD CAB, MID CAB, or AFT CAB.

(8) Depress TEMP SELECT switchlight to DUCT (latched in) position. DUCT legend in switchlight must come on.

(9) Observe CABIN TEMP indicator. Verify that temperature indicated is ambient temperature at the applicable sensor.

R (10) Install ceiling panel removed in Step 4A(2) (Ref. 25-26-01).

(11) Turn off electrical power (Ref. 24-00-00).

GALLEY DUCT TEMPERATURE INDICATION SENSOR - REMOVAL AND INSTALLATION

1. General

The galley duct temperature sensors for temperature control (Ref. 21-61-16) and for temperature indication (this sensor) are mounted in adjacent bosses in the galley supply air duct in the left check area outboard of the forward cargo compartment. Access to the sensors is through compartment sidewall panel 123 FL, with the sensors at FS 514.

2. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
25-51-06	Cargo Compartment Liner Panels - Removal and Installation

3. Equipment and Materials

O-ring, MS9385-05, or equivalent

Lockwire, 0.020-inch diameter, Fed. Spec. QQ-W-390 Cond A, or equivalent

Protective caps and plug

4. Removal/Installation

A. Removal

R (1) On Flight Engineer/Second Officers (FE/SO) aft circuit breaker panel CB3, zone 215, open and tag circuit breaker ECS - AIR TEMP - IND (V1).

(2) Open forward cargo compartment sidewall panel 123FL (Ref. 25-51-06).

(3) Disconnect electrical cable connector from hexagonal screw-in type sensor and install protective caps on connector and receptacle.

(4) Remove sensor (unscrew) from mounting boss.

(5) Remove and discard O-ring.

(6) If new sensor is not immediately available for installation, install protective plug in duct boss.

B. Installation

(1) Verify circuit breaker opened in Step 4A(1) is open and tagged.

(2) Remove protective plug from duct boss and verify boss is clean and undamaged.

(3) Install new O-ring on sensor and install and lock-wire sensor in duct boss.

(4) Remove protective caps and connect and lock-wire electrical cable connector to sensor receptacle.

(5) Remove tag and close circuit breaker opened in Step 4A(1).

(6) Turn on electrical power (Ref. 24-00-00).

R (7) On FE/SO ECS MONITOR panel, zone 215, rotate CABIN temperature indicator selector switch to GALLEY position.

(8) Depress TEMP SELECT switchlight to DUCT (latched in) position. DUCT legend in switchlight must come on.

(9) Observe CABIN TEMP indicator. Verify that temperature indicated is ambient temperature at the sensor.

R (10) Install compartment liner panel (Ref. 25-51-06).

(11) Turn off electrical power (Ref. 24-00-00).

R TEMPERATURE PROBE SIGNAL CONDITIONER
R REMOVAL AND INSTALLATION

R 1. General

R The two-channel temperature probe signal conditioner/amplifier
R is located in the Flight Engineer/Second Officer (FE/SO) upper
R instrument panel, zone 215, environmental control system (ECS)
R panel. Access is by loosening the integrated pneumatic system
R (IPS) control panel fasteners and extending the panel assembly.
R The signal conditioner is mounted within the IPS control panel
R frame structure (Ref. Fig. 401).

R 2. Equipment and Materials

R Protective Caps

R 3. Referenced Procedures

R 21-63-40 Temperature Probe Signal Conditioner - Adjustment
R and Test

R 4. Removal/Installation

R A. Removal

R (1) On FE/SO aft circuit breaker panel CB3, zone 215, open
R and tag BLEED AIR IND (R17) circuit breaker.

R (2) Loosen panel fasteners on IPS control panel and extend
R control panel on its support slides from the FE/SO
R upper instrument panel.

R (3) Remove nuts retaining plug-in signal conditioner to
R base.

R (4) Remove signal conditioner by pulling unit from base.

R (5) Install protective caps on connectors if base and
R signal conditioner if there is to be a delay before
R installation of a replacement signal conditioner.

R B. Installation

R (1) Verify that circuit breaker opened in Step 4A(1) is
R open and tagged.

(2) Remove protective caps.

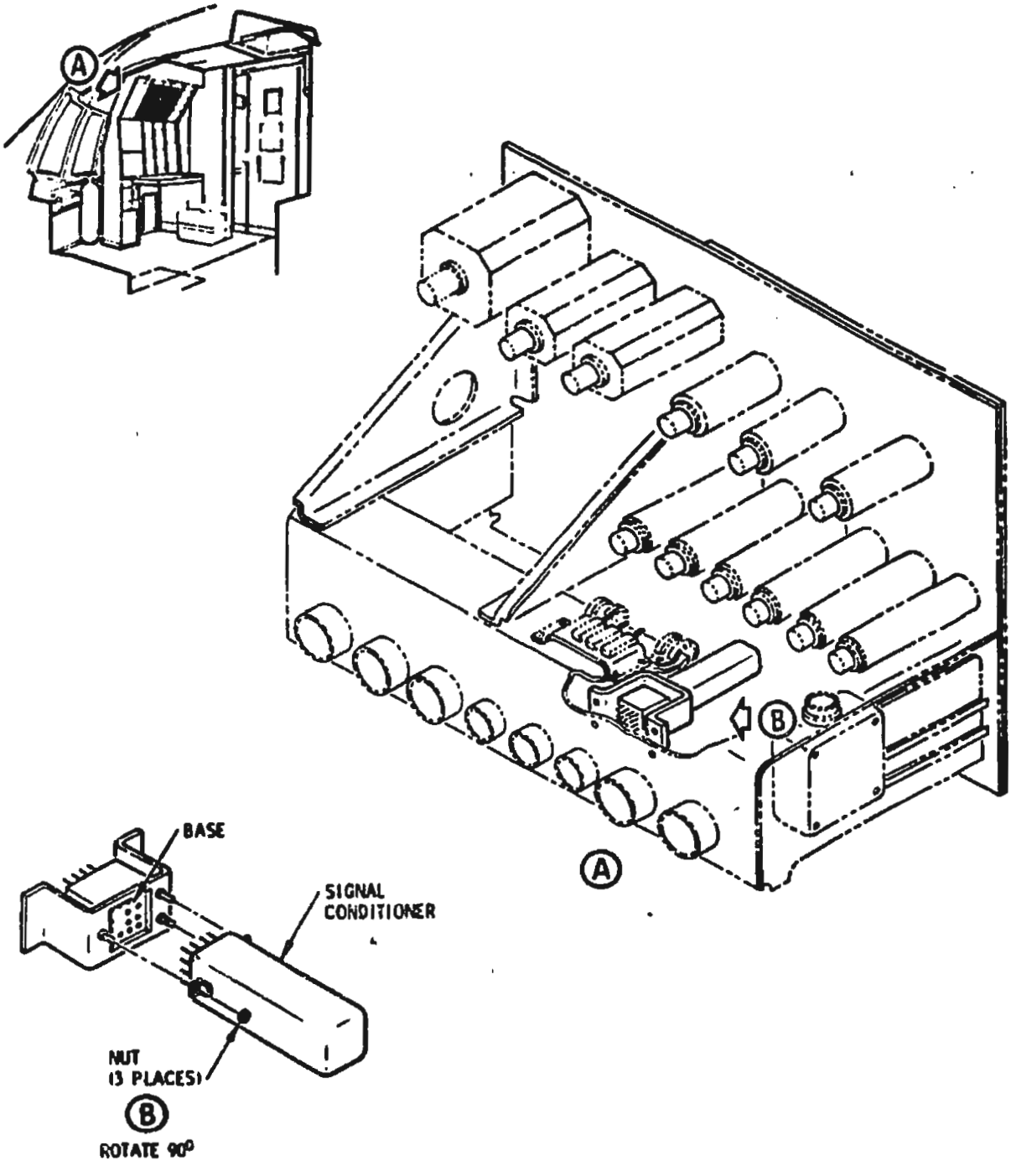
(3) Insert signal conditioner pins into base socket.

(4) Install and tighten retaining nuts.

(5) Slide IPS control panel into FE/SO upper instrument panel and tighten control panel fasteners.

(6) Remove tag and close circuit breaker opened in Step 4A(1).

R (7) Operate ECS MONITOR, ECS TEMP indicator to check for ambient PACK INLET temperature.



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R Pack Temperature Signal Conditioner – Removal and Installation
R Figure 401

R EFFECTIVITY: TWO CHANNEL SIGNAL CONDITIONER

001B

TEMPERATURE PROBE SIGNAL CONDITIONER REMOVAL AND INSTALLATION

1. General

The twenty-two channel temperature probe signal conditioner is located in the forward electronics service center (FESC), zone 113, in the rear electronics rack. Access is through either FESC external access door 112AB or flight station access door 211CB.

The twenty-two channel signal conditioner supplies signals to the Aircraft Integrated Data System (AIDS) in addition to the ECS Monitor.

2. Equipment and Materials

Protective Caps

3. Referenced Procedures

20-23-01	Electronic Equipment Rack Front Holddown Extractor - Maintenance Practices
21-63-40	Temperature Probe Signal Conditioner - Adjustment and Test
31-32-00	Aircraft Integrated Data System - Adjustment and Test

4. Removal/Installation

A. Removal

(1) On FE/SO aft circuit breaker panel CB3, zone 215, open and tag ECS AIR TEMP IND (V1) circuit breaker.

(2) Open FESC access door 211CB or 112AB.

(3) At aft electronics rack lower shelf, disengage front holddown extractors retaining the signal conditioner (Ref. 20-23-01).

(4) Pull signal conditioner from rack.

(5) Install protective caps on rack receptacle and signal conditioner connector.

R B. Installation

R (1) Verify that circuit breaker opened in Step 4A(1) is
R open and tagged.

R (2) Remove protective caps from signal conditioner and rack
R receptacle.

R (3) Slide signal conditioner into rack and engage front
R holddown extractors (Ref. 20-23-01).

R (4) Close FESC access doors 211CB and 112AB.

R (5) Remove tag and close circuit breaker opened in Step
R 4A(1).

R (6) Check operation of ECS and CABIN temperature monitor
R using twenty-two channel signal conditioner (Ref.
R 21-63-40 Adjustment and Test).

R (7) Check aircraft integrated data system for ECS and cabin
R temperature operation (Ref. 31-32-00).

TEMPERATURE PROBE SIGNAL CONDITIONER ADJUSTMENT AND TEST

1. General

Operation of the temperature probe signal conditioner is observed on the ECS MONITOR panel ECS-TEMP indicator at the Flight Engineer/Second Officer (FE/SO) upper instrument panel, zone 215. No adjustment is made to the temperature signal conditioner installed in the aircraft. The following test is operational go/no-go indication of the signal conditioner.

2. Referenced Procedures

24-00-00 Electrical Power - Maintenance Practices

3. Adjustment/Test

A. Operational Test

(1) On ECS MONITOR panel, set ECS-TEMP selector switch to any one of first four positions. Observe an ambient temperature indication on ECS-TEMP indicator.

EFFECTIVITY: TWO CHANNEL SIGNAL CONDITIONER

0018

TEMPERATURE PROBE SIGNAL CONDITIONER ADJUSTMENT AND TEST

1. General

Operation of the 22 channel temperature probe signal conditioner is verified by two procedures. Operation of sixteen channels used by the ECS monitor system is observed on the ECS-TEMP indicator and the CABIN - TEMP indicator on the ECS MONITOR panel. The ECS MONITOR panel is located on the Flight Engineer/Second Officer (FE/SO) upper instrument panel, zone 215. The other six channels are verified by operation of the Aircraft Integrated Data System (AIDS). The AIDS control is located on the FE/SO lower instrument panel, zone 215.

No adjustment is made for the temperature probe signal conditioner in the aircraft.

2. Referenced Procedures

24-00-00	Electrical Power - Maintenance Practices
31-32-00	Aircraft Integrated Data System - Adjustment and Test

3. Adjustment/Test

A. Operational Test

(1) On ECS MONITOR panel, set ECS - TEMP selector switch to TURB INLET position.

(2) Set PACK SELECT switch to each position in sequence. Observe an ambient temperature indication on ECS - TEMP indicator for each of the three switch positions.

(3) Set ECS - TEMP selector switch to CPRSR DISCH position and repeat Step (2).

(4) Press TEMP SELECT switchlight for ZONE indication.

(5) Set CABIN - TEMP selector switch to each position in sequence. Observe an ambient temperature indication for each of the five switch positions.

(6) Press TEMP SELECT switchlight for DUCT indication then repeat Step (5).

R (7) For the six channels associated with AIDS, perform AIDS Operational Test (Ref. 31-32-00 Adjustment and Test). Use system selector positions ECS and ENGINE or ALL. Request AIDS verification of signals 101 and 105.

BUILT-IN SYSTEM TEST - DESCRIPTION AND OPERATION

1. General

The built-in system test provides a means of testing the temperature control system. The built-in system test will isolate open and short circuit failures and unit failures. It is not designed to detect minor changes in signal levels due to component shifts caused by aging or deterioration. The built-in system test is used only on the ground, with the environmental control system shut down.

The built-in system test system consists of a temperature control test module (TCTM) and the necessary electrical connections. The TCTM is located in the electrical rack in the forward electronic service center, zone 112.

The TCTM is connected to three pack temperature controllers, five zone temperature controllers, five zone trim valve control switches, and electrical power (Ref. Fig. 1).

The built-in system test will detect failure of the following line replaceable units (LRU):

Zone trim control valves

Pack flow control valves (close limit switch only)

Ram air control actuators

Turbine bypass valves

Pack temperature sensors

Zone temperature sensors

Zone duct temperature sensors

Temperature selectors

On aircraft without SB21-115, pack ice sensors

2. Operation

Two multiposition rotary switches on the face of the TCTM (Ref. Fig. 2) are used to select the system and function to be tested. A PUSH TO TEST switch is then pressed and held until either the GO or NO-GO indicator light comes on. When the PUSH TO TEST

switch is pressed, simulated signals are applied to the selected circuit, and the circuit response is compared to a standard within the TCTM. The result of the comparison causes the decision light to come on. A TEST IN PROGRESS light comes on during the time that the PUSH TO TEST switch is held and the test is being made. This light will go out when the decision light comes on.

Flip charts on the TCTM cover panel give condensed operating instructions and identify the faulty component which caused the NO-GO indication.

C 3. Modified Pack Temp Controllers R&R 31134

CR A. All L-1011 Pack Temp Controllers have been modified to the
CR new configuration, P/N 763880-1. The new configuration has
C two basic changes.

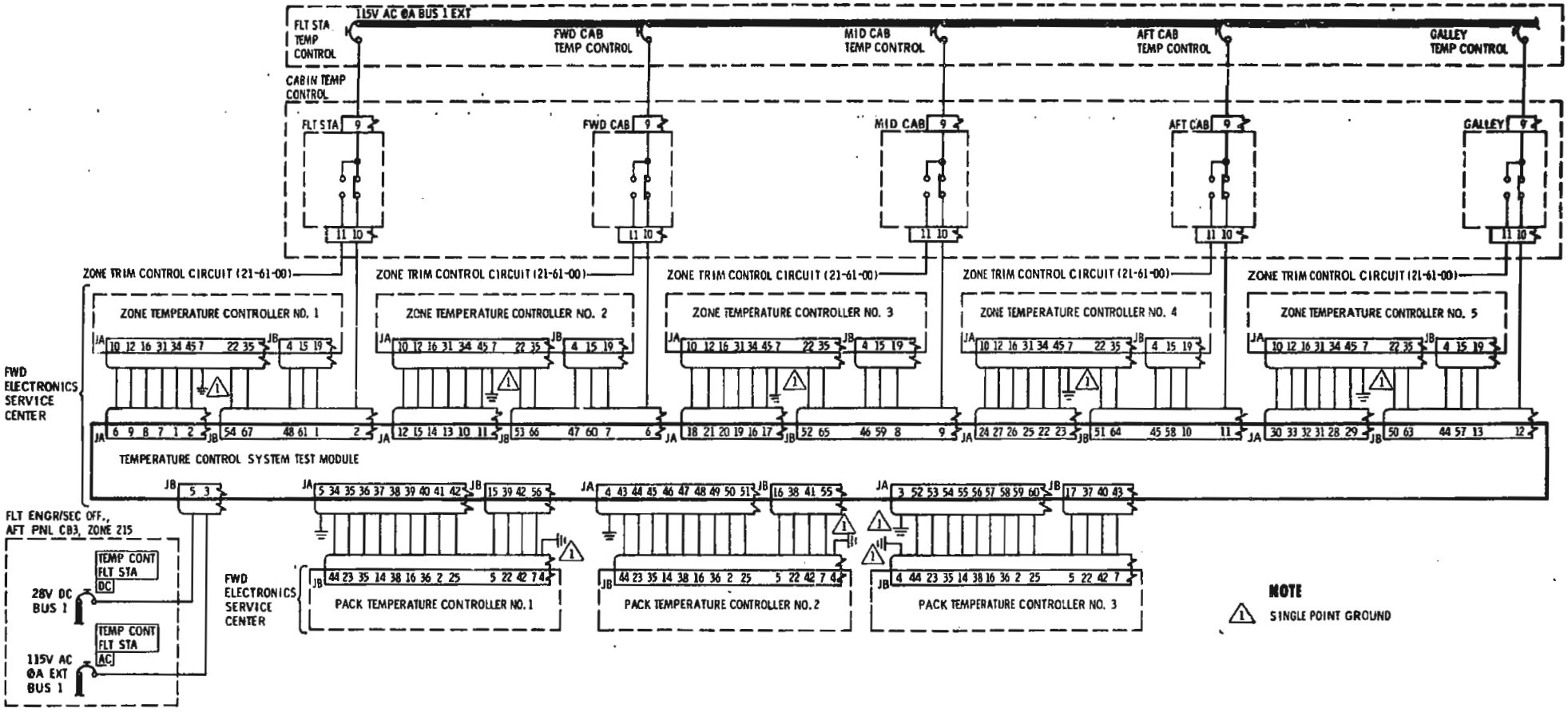
C (1) Deletion of the control circuit of the Ice Sensor on
C the water separator.

C (2) Addition of new 38°F low limit control.

CR B. Deleted.

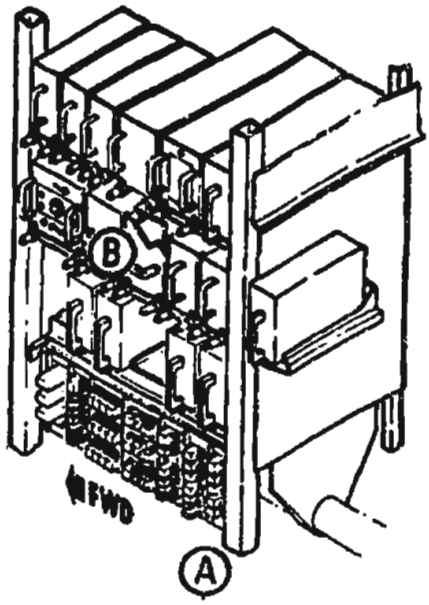
C C. In addition with a modified pack controller installed, the
C Temp Control Test Module will not test two items, "D" =
CR Controller and "K" = Pack Ice Sensor.

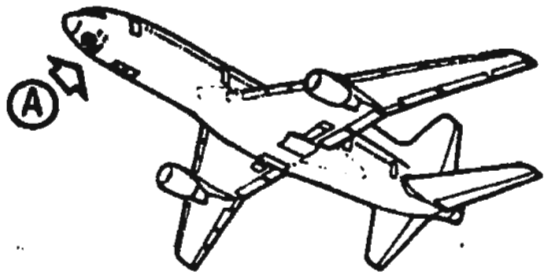
C D. As an aid to maintenance a placard is being installed on the
C instruction plate of the test module to state that, "D and K
C Test Not Valid with Controller P/N 763880-1", figure 3
C illustrates the placard installed on the instruction plate.


115V AC ØA BUS 1 EXT
FLT STA TEMP CONTROL
FWD CAB TEMP CONTROL
MID CAB TEMP CONTROL
AFT CAB TEMP CONTROL
GALLEY TEMP CONTROL
CABIN TEMP CONTROL
FLT STA
FWD CAB
MID CAB
AFT CAB
GALLEY
ZONE TRIM CONTROL CIRCUIT (21-61-00)
ZONE TEMPERATURE CONTROLLER NO. 1
ZONE TEMPERATURE CONTROLLER NO. 2
ZONE TEMPERATURE CONTROLLER NO. 3
ZONE TEMPERATURE CONTROLLER NO. 4
ZONE TEMPERATURE CONTROLLER NO. 5
FWD ELECTRONICS SERVICE CENTER
TEMPERATURE CONTROL SYSTEM TEST MODULE
FLT ENGR/SEC OFF., AFT PNL CB3, ZONE 215
TEMP CONT FLT STA DC
28V DC BUS 1
TEMP CONT FLT STA AC
115V AC ØA EXT BUS 1
FWD ELECTRONICS SERVICE CENTER
PACK TEMPERATURE CONTROLLER NO. 1
PACK TEMPERATURE CONTROLLER NO. 2
PACK TEMPERATURE CONTROLLER NO. 3
NOTE
1 SINGLE POINT GROUND

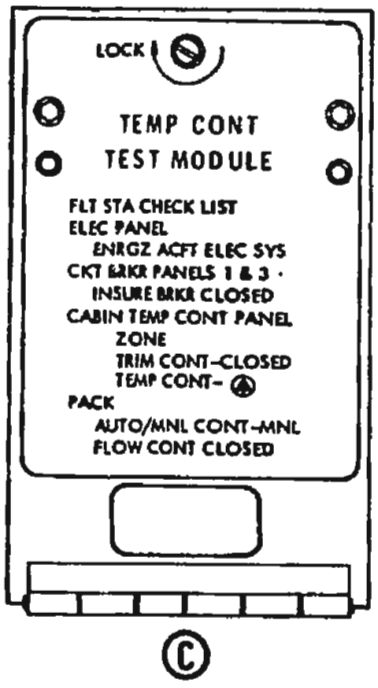
G 844
EM1-0103-21-070

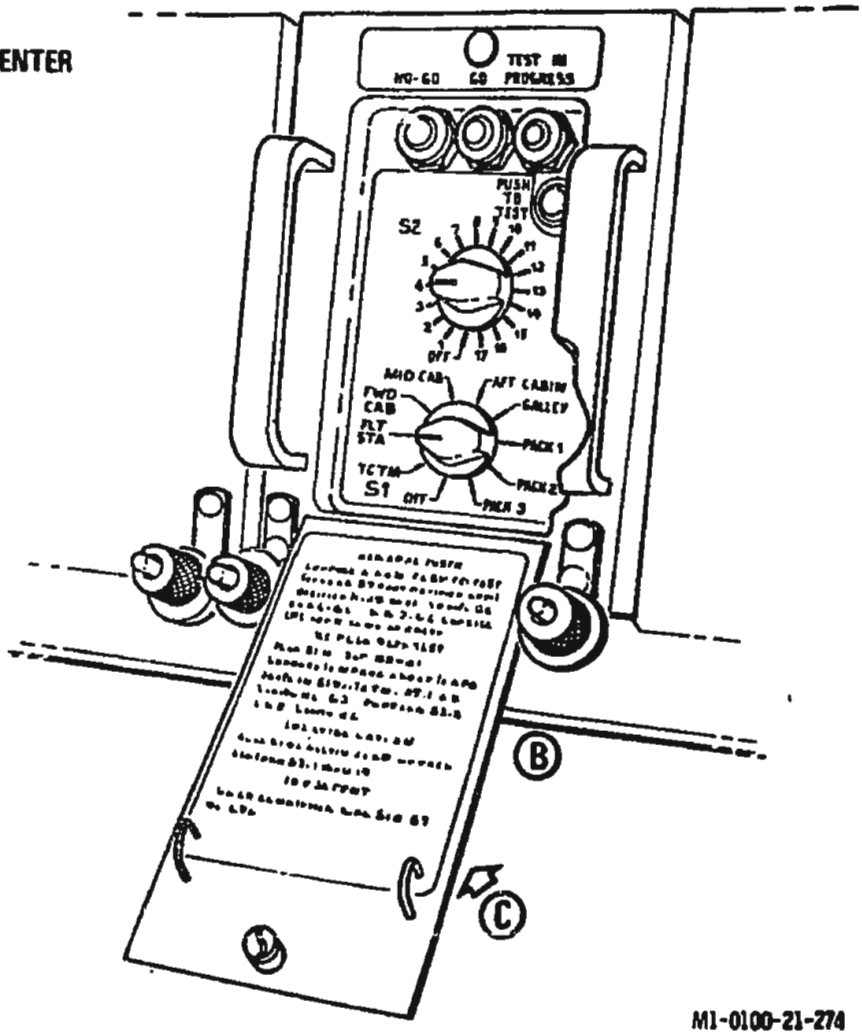
Built-in System Test Schematic
Figure 1





FORWARD ELECTRONIC SERVICE CENTER
ELECTRICAL RACK





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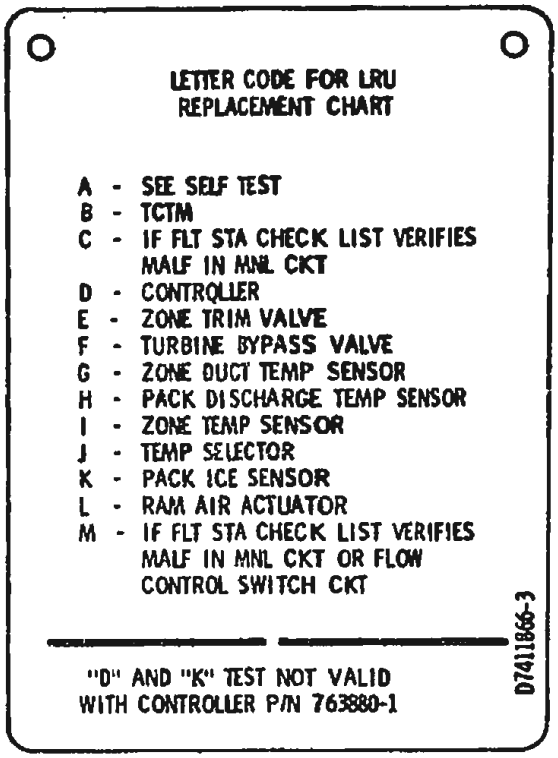
Temperature Control Test Module
Figure 2


LETTER CODE FOR LRU
REPLACEMENT CHART
A - SEE SELF TEST
B - TCTM
C - IF FLT STA CHECK LIST VERIFIES MALF IN MNL CKT
D - CONTROLLER
E - ZONE TRIM VALVE
F - TURBINE BYPASS VALVE
G - ZONE DUCT TEMP SENSOR
H - PACK DISCHARGE TEMP SENSOR
I - ZONE TEMP SENSOR
J - TEMP SELECTOR
K - PACK ICE SENSOR
L - RAM AIR ACTUATOR
M - IF FLT STA CHECK LIST VERIFIES MALF IN MNL CKT OR FLOW CONTROL SWITCH CKT
"D" AND "K" TEST NOT VALID WITH CONTROLLER P/N 763880-1
D7411866-3

M1-0000-21-2160

CR
CR

Test Module Placard
Figure 3

R EFFECTIVITY: ALL
R
001B

R # BUILT-IN SYSTEM TEST - FAULT ISOLATION

R 1. General

R Reference data and fault isolation procedures for troubleshooting Built-In Test system faults are included in this section of the manual. A system malfunction detected by the flight crew is normally entered in the aircraft flight log book and reported to maintenance personnel with a FIRM fault code number. This number and the flight log book write-up can be found in the Chapter Fault Code Index. The index specifies the maintenance manual section, fault isolation diagram figure number and, where appropriate, a block number indicating the diagram entry point containing the fault isolation procedure. When no block number is specified, the diagram entry point is block 1.

R PREREQUISITES listed at the top of each diagram identify mandatory preliminary steps and circuit breakers that must be closed before initiating any fault isolation step.

R Schematic diagrams, identified by a SCHEM number, supplement fault isolation procedures as maintenance aids. The schematics show the basic system circuitry necessary for troubleshooting and include cross-reference indexes to the wiring diagram manual pages required for checking component interconnection wiring.

R Figure 101, Component Location Index, is an alphabetical listing of all components associated with the Built-In Test system. It gives the area and access of each component and its respective removal and installation reference.

R Figure 102, Component Locator Diagram, illustrates the location on the aircraft of all the components listed in the Component Location Index.

R Refer to the Maintenance Manual Introduction for a more detailed description of the Fault Isolation Reporting Method (FIRM) and use of fault isolation diagrams/schematics.

R 2. Supplemental Data

R For interconnection between TCTM and Pack Temperature controllers refer to 21-62-00, SCHEM 4. For interconnection between TCTM and zone temperature controllers refer to 21-61-00, SCHEM 2.

R 21-60-00 Temperature Control - Adjustment and Test

R 21-64-01 Temperature Control Test Module - Removal and Installation

R A. Procedure

R (1) Perform initial portion of temperature control system adjustment and test procedure, Steps 3A(1) through (6) (Ref. 21-60-00).

R (2) Perform TCTM self-test and fault isolation procedures by following procedure detailed on TCTM flip charts, using schematics for fault isolation as pertinent.

R (3) Test results other than as detailed on TCTM flip charts indicate TCTM malfunction. Replace TCTM (Ref. 21-64-01).

R 3. Fault Isolation/Identification

R Table 101 is a list of all fault isolation data in this section of the manual.

R TABLE 101

FIGURE	TITLE
101	Component Location Index
102	Component Locator Diagram
SCHEM 1	Built-In System Test Schematic

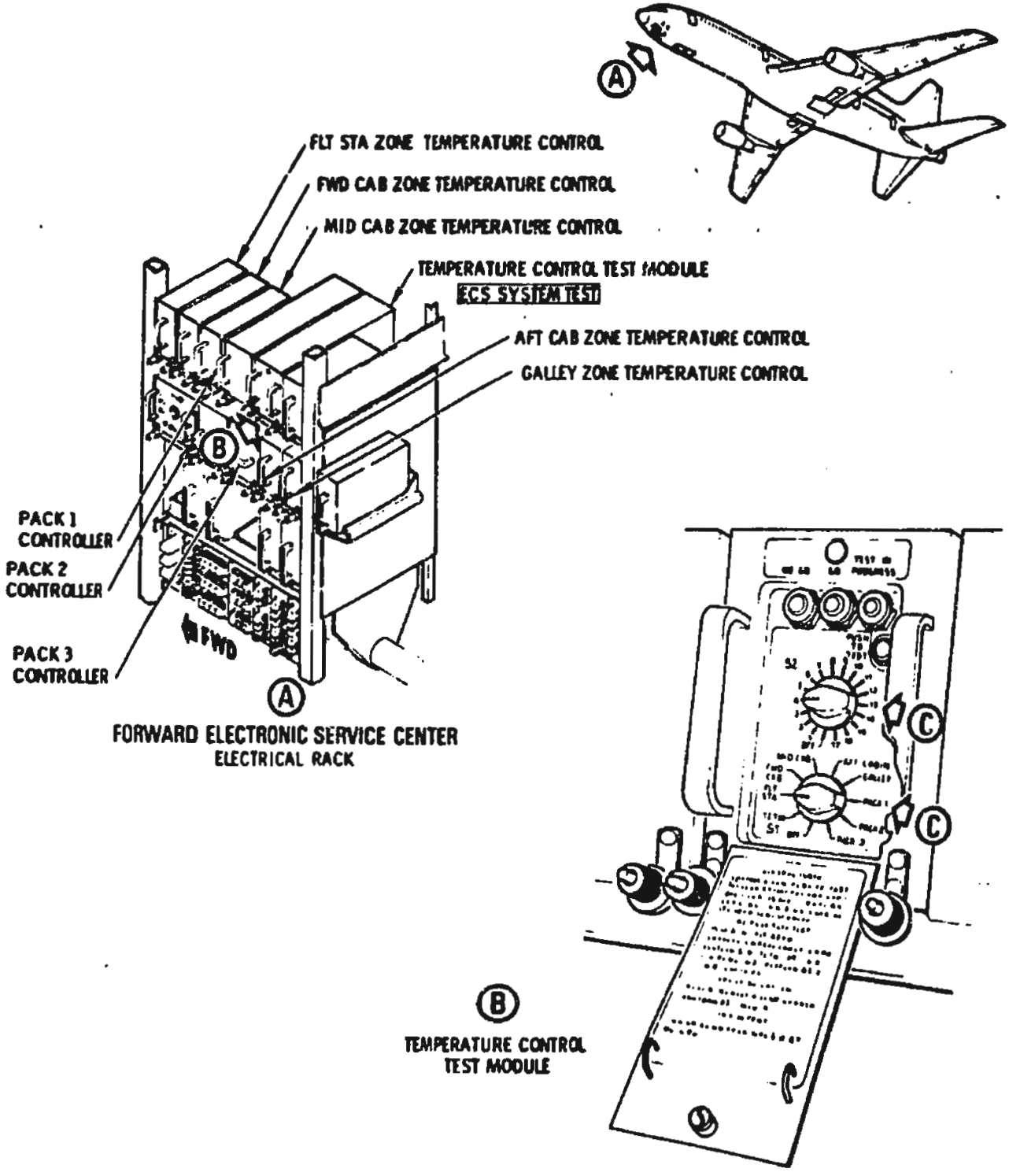
COMPONENT	QTY	AREA/ACCESS	REFERENCE
CONTROL, AFT CAB ZONE TEMPERATURE	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROL, FLT STA ZONE TEMPERATURE	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROL, FWD CAB ZONE TEMPERATURE	1	FESC, RIGHT ELECTRICAL RACK 112AB	21-64-01
CONTROL, GALLEY ZONE TEMPERATURE	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROL, MID CAB ZONE TEMPERATURE	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROLLER, PACK 1	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROLLER, PACK 2	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
CONTROLLER, PACK 3	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01
MODULE, TEMPERATURE CONTROL TEST	1	FESC, RIGHT ELECTRICAL RACK/112AB	21-64-01

M1-0000-21-1481

R Component Location Index
R Figure 101

EFFECTIVITY: ALL

001B



FORWARD ELECTRONIC SERVICE CENTER
ELECTRICAL RACK

TEMPERATURE CONTROL TEST MODULE

M1-57200-21-455

R
R

Component Locator Diagram
Figure 102

EFFECTIVITY: ALL

001B

EFFECTIVITY

1. ON AIRCRAFT 001-030 WITH TCTM 72448-0 HAMILTON STANDARD PART NUMBER
2. ON AIRCRAFT 001-030 WITH 72448-5 OR 7638704-1 HAMILTON STANDARD PART NO. OR WITH SB 21-116 AND 031-999
3. ON AIRCRAFT WITHOUT SB21-116
4. ON AIRCRAFT WITH SB21-116

NOTE

1. [1-1] - CROSS REF. TO SCHEM AND SHEET IN SAME ATA NO.
2. [22-10-00, 1] - CROSS REF. TO SCHEM IN DIFFERENT ATA NO.
3. (2, 3) - CROSS REF. TO SHEET NO. IN SAME SCHEM
4. ←4→ - NO. IN WIRE PROVIDES CODE FOR WM DIA CROSS REF.

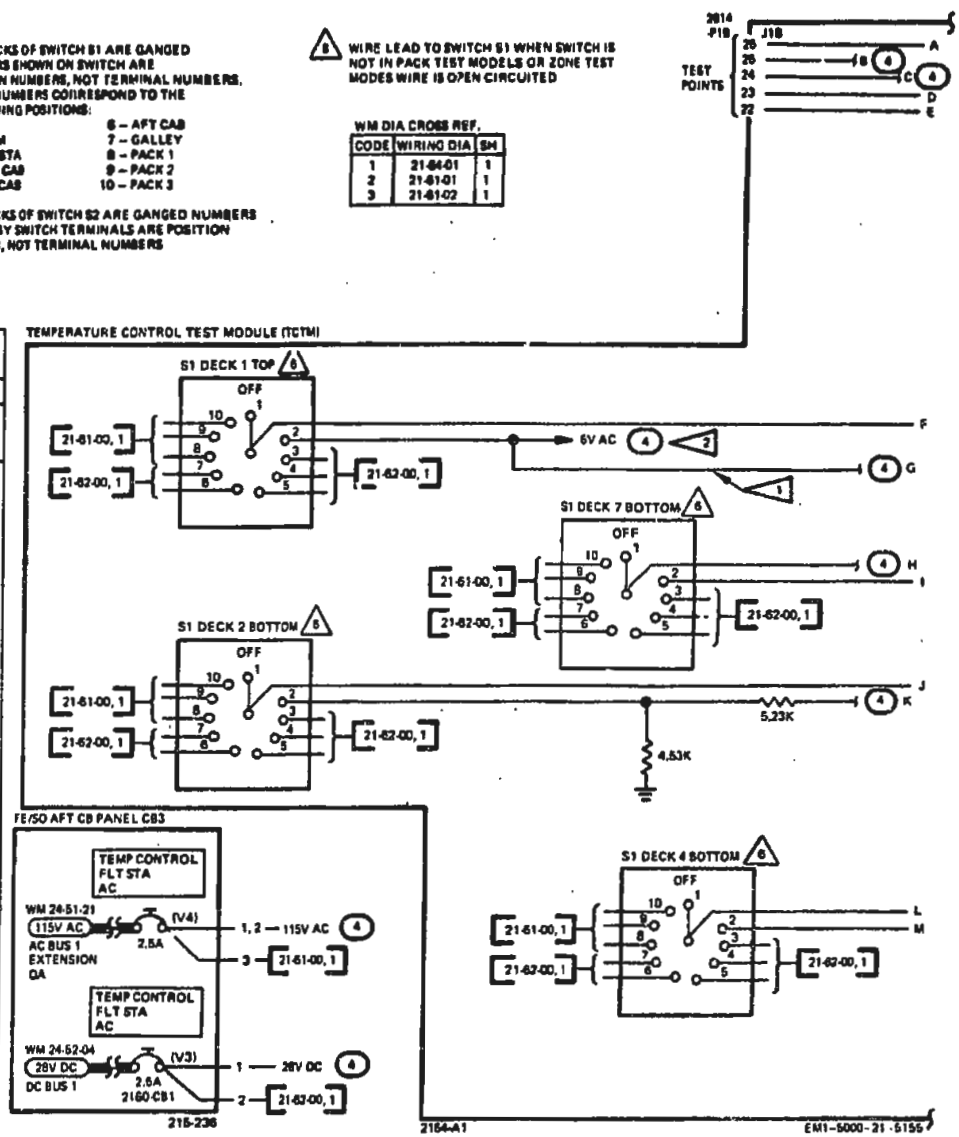
5. GO LIGHT PROVIDED AUTOMATICALLY AT END OF TEST INTERVAL
6. ALL DECKS OF SWITCH S1 ARE GANGED NUMBERS SHOWN ON SWITCH ARE POSITION NUMBERS, NOT TERMINAL NUMBERS. THESE NUMBERS CORRESPOND TO THE FOLLOWING POSITIONS:
   1 – OFF; 2 – TCTM; 3 – FLT STA; 4 – FWD CAB; 5 – MID CAB; 6 – AFT CAB; 7 – GALLEY; 8 – PACK 1; 9 – PACK 2; 10 – PACK 3
7. ALL DECKS OF SWITCH S2 ARE GANGED NUMBERS SHOWN BY SWITCH TERMINALS ARE POSITION NUMBER, NOT TERMINAL NUMBERS
8. WIRE LEAD TO SWITCH S1 WHEN SWITCH IS NOT IN PACK TEST MODES OR ZONE TEST MODES WIRE IS OPEN CIRCUITED

WM DIA CROSS REF.

CODE	WIRING DIA	SH
1	21-64-01	1
2	21-61-01	1
3	21-61-02	1

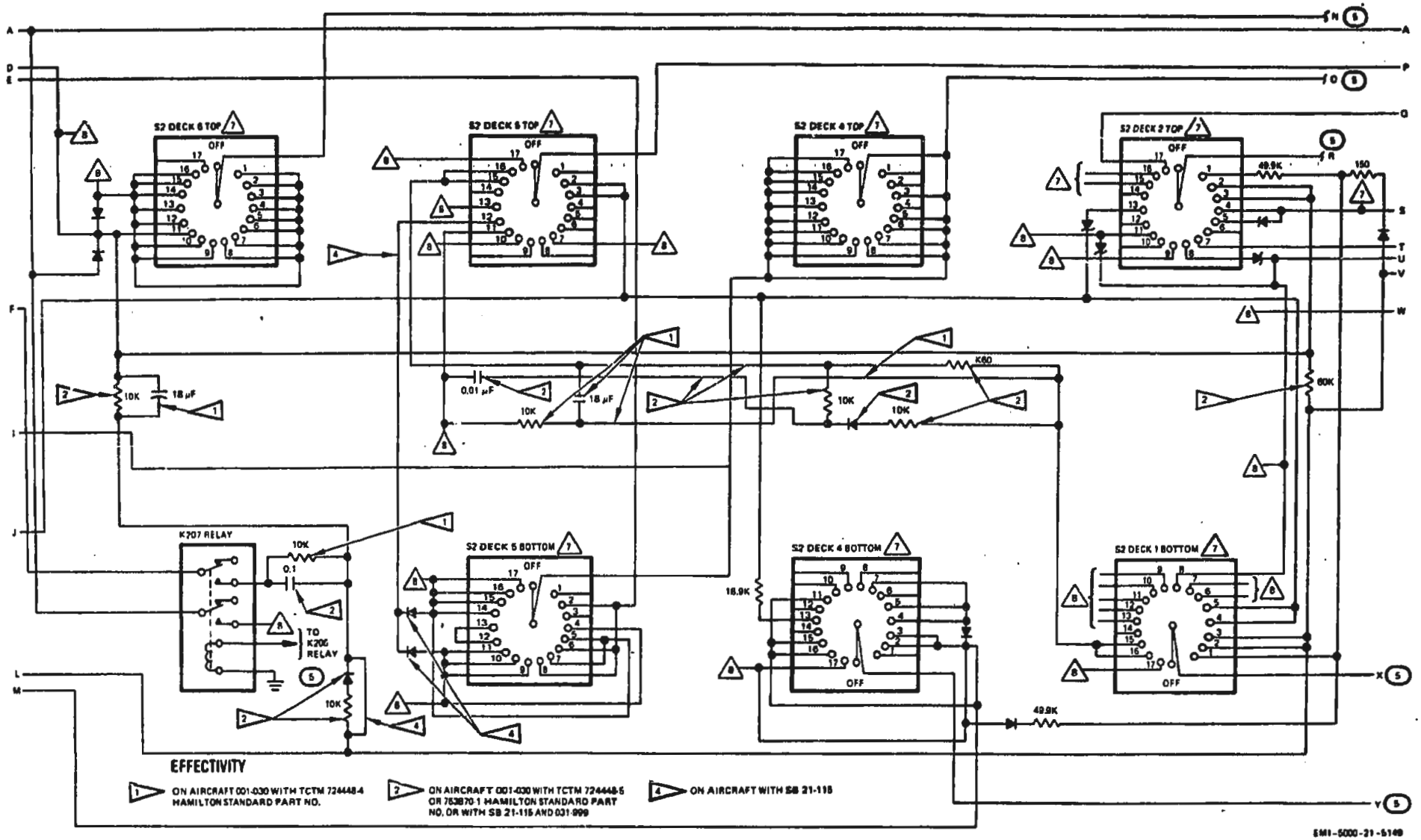
TABLE 1
SWITCH SELECTION AND FUNCTION TEST

S2 POSITION	S1					
	TCTM POSITION 2 (SELF TEST)	TIME DELAY (SEC)	ZONE POSITIONS 3 THRU 7 (ZONE CONTROLLERS TEST)	TIME DELAY (SEC)	PACK POSITIONS 8 THRU 10 (PACK CONTROLLERS TEST)	TIME DELAY (SEC)
1	NO-GO LIGHT	4.8	MANUAL PUSH BUTTON	4.8	FLOW CONTROL VALVE	4.8
2	NO-GO LIGHT	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
3	5	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
3	GO LIGHT	24.6	ZONE TRIM VALVE ACTUATOR DRIVE	24.6	TURBINE BYPASS VALVE ACTUATOR DRIVE	24.6
4	NO-GO LIGHT	47.0	ZONE TRIM VALVE POSITIONING	47.0	5	47.0
4	GO LIGHT	47.0	ZONE TRIM VALVE POSITIONING	47.0	6	47.0
5	5	24.6	6	24.6	TURBINE BYPASS VALVE POSITIONING	24.6
6	5	4.8	ZONE DUCT SENSOR	4.8	PACT DUCT SENSOR	4.8
7	5	24.6	6	24.6	TURBINE BYPASS VALVE GROUND CLAMPS	24.6
8	5	4.8	DUCT ERROR TRACKING	4.8	PREPOSITIONING	4.8
9	5	24.6	ZONE SENSOR	24.6	5	24.6
10	5	4.8	ZONE SELECTOR	4.8	5	4.8
11	5	47.0	AUTO TRACKING	47.0	5	47.0
12	5	4.8	6	4.8	PACK ICE SENSOR	4.8
12	5	4.8	6	4.8	6	4.8
13	5	24.6	5	24.6	ICE CONTROL LOAD	24.6
13	5	24.6	5	24.6	5	24.6
14	5	4.8	5	4.8	5	4.8
15	5	4.8	5	4.8	RAM ACTUATOR DRIVE	4.8
16	5	4.8	5	4.8	RAM ACTUATOR DRIVE	4.8
17	5	24.6	5	24.6	RAM POSITIONING	24.6



Built-in System Test Schematic
SCHEM 1 (Sheet 1)

EFFECTIVITY: ALL

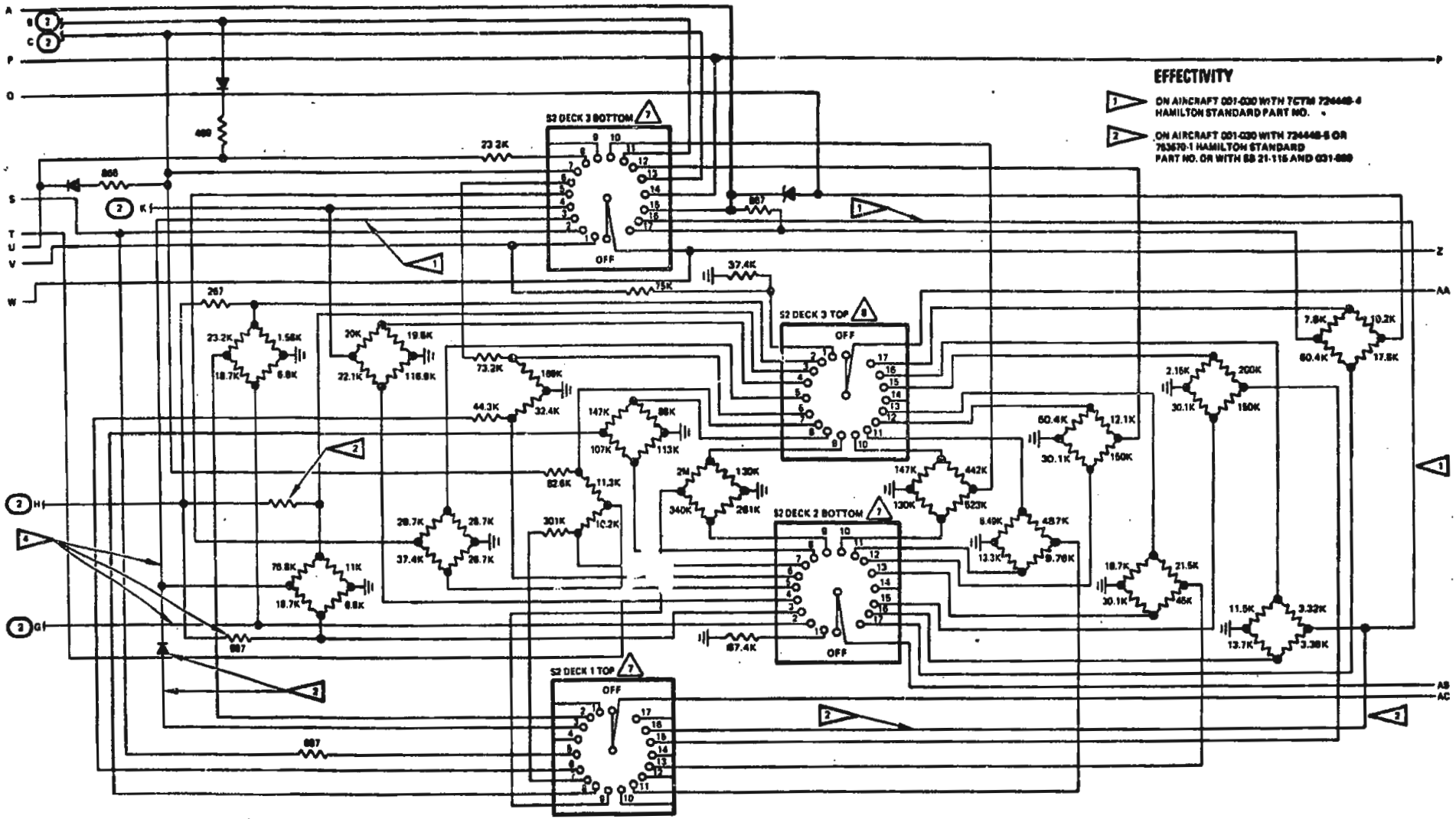


R
R

Built-In System Test Schematic
SCHEM 1 (Sheet 2)

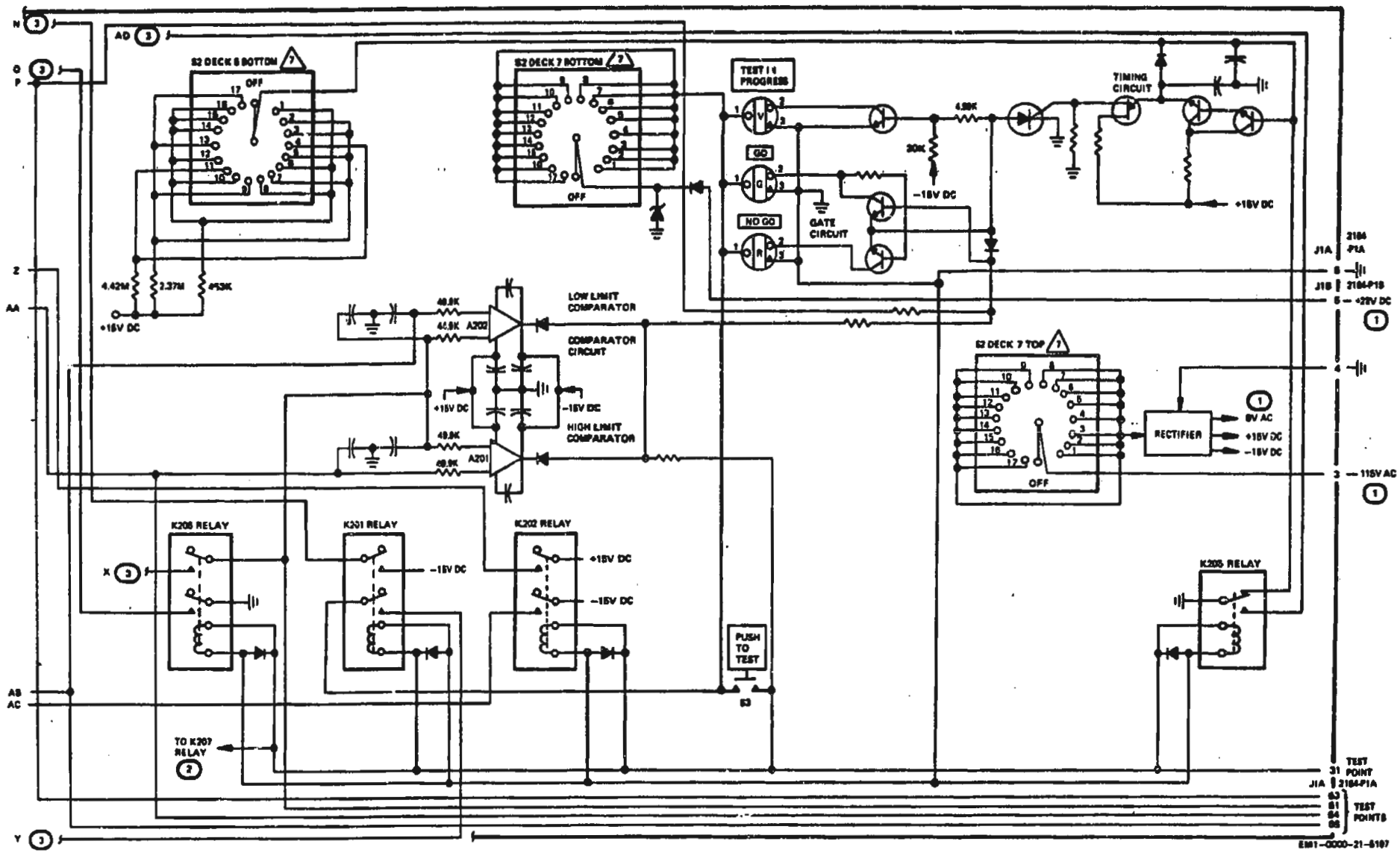
EFFECTIVITY: ALL

0018


EFFECTIVITY
1 ON AIRCRAFT 001-030 WITH TCTM 724448-4 HAMILTON STANDARD PART NO.
2 ON AIRCRAFT 001-030 WITH 724448-5 OR 763570-1 HAMILTON STANDARD PART NO. OR WITH SB 21-115 AND 031-999
S2 DECK 3 BOTTOM
S2 DECK 3 TOP
S2 DECK 2 BOTTOM
S2 DECK 1 TOP
OFF
23.2K
75K
37.4K
887
EM1-6000-21-6300

Built-In System Test Schematic
SCHEM 1 (Sheet 3)

EFFECTIVITY: ALL



Built-In System Test Schematic
SCHEM 1 (Sheet 4)

EFFECTIVITY: ALL

001B

TEMPERATURE CONTROL TEST MODULE - REMOVAL AND INSTALLATION

1. General

The temperature control test module (TCTM) is installed in the electrical equipment rack in the forward electronic service center (FESC).

2. Equipment and Materials

Protective caps

3. Referenced Procedures

20-23-01 Electronic Equipment Rack Front Holddown Extractor - Maintenance Practices

21-60-00 Temperature Control - Adjustment and Test

4. Removal/Installation

A. Removal

R (1) Tag Flight Engineer/Second Officers (FE/SO) bleed air
R and APU control panels and three high pressure ground
R air connections to prevent system operation until
R completion of procedure.

R (2) On (FE/SO) aft circuit breaker panel, zone 215, open
R and tag following circuit breakers:

TEMP CONT - FLT STA - DC (V3)

TEMP CONT - FLT STA - AC (V4)

PACK 1 - AUTO/MAN - DC (V5)

PACK 1 - AUTO/MAN - AC (V6)

PACK 2 - AUTO/MAN - DC (V7)

PACK 2 - AUTO/MAN - AC (V8)

ZONE CENTER TEMPERATURE CONTROL -

FWD CAB - DC (V9)

FWD CAB - AC (V10)

MID CAB - DC (V11)

MID CAB - AC (V12)

AFT CAB - DC (V13)

AFT CAB - AC (V14)

GALLEY - DC (V15)

GALLEY - AC (V16)

PACK 3 - AUTO/MAN - DC (V17)

PACK 3 - AUTO/MAN - AC (V18)

R (3) Gain access to FESC.

R (4) In FESC, on top shelf of electrical rack right side of
R access door, release holddown extractors (Ref.
R 20-23-01) at bottom of TCTM.

R (5) Support weight of TCTM and gently pull TCTM inboard to
R remove from rack.

R (6) Install protective caps on electrical connectors at rear of exposed rack position and on rear of TCTM.

B. Installation

R (1) Verify circuit breakers opened in Step 4A(2) are open and tagged.

(2) In FESC, remove protective cap from electrical connector at rear of TCTM position and carefully inspect connector to verify it is clean and undamaged.

(3) Remove protective cap from electrical connector on rear of TCTM and carefully inspect connector to verify it is clean and undamaged.

(4) Lift TCTM into position to enter rack, and gently slide TCTM outboard into rack until electrical connectors start to mate.

(5) Verify electrical connectors are mating properly, then push TCTM outboard into rack enough to engage holddown extractors at bottom front of TCTM.

(6) Torque holddown extractors (Ref. 20-23-01).

R (7) Remove tags and close circuit breakers opened in Step
R 4A(2).

R (8) Remove tags installed in Step 4A(1).

(9) Verify proper ICTM installation by performing complete
R BITE test (Ref. 21-60-00).